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(71)Applicant : JUKI CORP

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(72)Inventor : YANO NOBUO

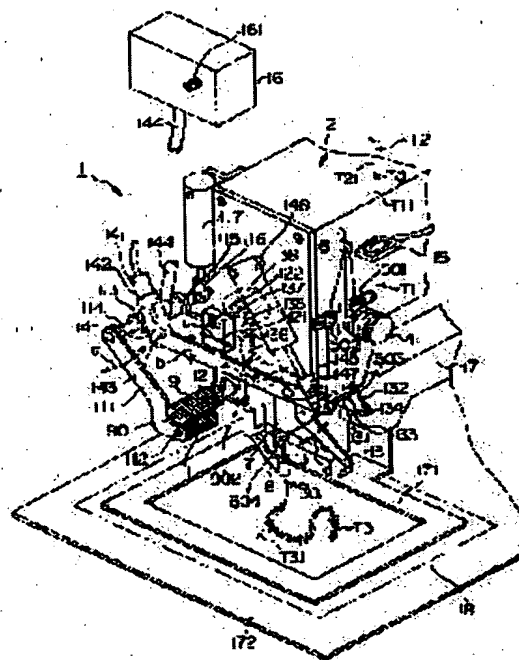
HIRAMATSU TORU

(54) EXCHANGE THREAD DRAWING DEVICE FOR SEWING MACHINE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an exchange thread drawing device for a sewing machine, allowing an easy subsequent recovery work, even upon the occurrence of a failure of connecting original thread to exchange thread, and ensuring high sewing work efficiency, regarding the exchange thread drawing device for a sewing machine where exchange thread is drawn from a bobbin and passed through a needle eye by drawing original thread therefrom after the connection thereof to the exchange thread for the exchange of needle thread.

SOLUTION: A driving gear 9 and a driven gear 11 draw original thread T1 from a needle eye 301, and exchange thread T2 connected at the cut end T11 of the original thread T1 and the leading end T21 thereof in a thread passage between a bobbin and the needle eye 301 is thereby drawn from the bobbin for being passed through the needle eye 301. A knot detector 15 detects that no connection is made between the threads T1 and T2 at a drawing process. When this non-connected state is detected, CPU causes the driving and driven gears 9 and 11 to stop drawing of the original thread T1 and then stops the progress of a subsequent sewing process.



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CLAIMS

[Claim(s)]

[Claim 1] Exchange thread cash-drawer equipment of a sewing machine characterized by providing the following The threader section which pulls out exchange thread connected by amputation stump section [of former thread cut in a thread path between a bobbin and a pinholing], and thread cash-drawer edge side from a bobbin side by pulling out said former thread from said pinholing, and lets it pass to a pinholing A detecting element which detects that this connection was not made after connection of said both thread It is the control section which stops a cash drawer of said former thread twisted in said threader section, and a subsequent sewing activity when it is detected that this connection was not made.

[Claim 2] The threader section which pulls out exchange thread connected by amputation stump section [of former thread cut in a thread path between a bobbin and a pinholing], and thread cash-drawer edge side from a bobbin side by pulling out said former thread from said pinholing, and lets it pass to a pinholing, It has a detecting element which detects that this connection was made after connection of said both thread. Said threader section Exchange thread cash-drawer equipment of a sewing machine which is what lets said exchange thread pass to said pinholing by leading a portion of said former thread passed [pinholing] from said pinholing, and pulling out predetermined thread length set up beforehand from said pinholing after said connection is detected.

[Claim 3] Exchange thread cash-drawer equipment of a sewing machine characterized by providing the following The threader section which pulls out exchange thread connected by amputation stump section [of former thread cut in a thread path between a bobbin and a pinholing], and thread cash-drawer edge side from a bobbin side by pulling out said former thread from said pinholing, and lets it pass to a pinholing It is the detecting element which is equipped with the prehension section which catches a portion of said former thread passed [pinholing], and detects fluctuation of tension which said threader section pulls out said former thread from said pinholing by driving said prehension section in said seized condition after connection of said both thread, and said prehension section receives from said former thread during said former thread cash-drawer activity. It is the control section which stops a cash drawer of said former thread twisted in said threader section, and a subsequent sewing activity when this tension fluctuation changes into a predetermined condition.

[Claim 4] Exchange thread cash-drawer equipment of a sewing machine characterized by providing the following The threader section which pulls out exchange thread connected by amputation stump section [of former thread cut in a thread path between a bobbin and a pinholing], and thread cash-drawer edge side from a bobbin side by pulling out said former thread from said pinholing, and lets it pass to a pinholing The thread cutting section which leaves predetermined length and cuts thread [finishing / said pinholing passage] from said pinholing after this threader A thread length controller which adjusts this predetermined thread length left behind

[Claim 5] Said threader section is exchange thread cash-drawer equipment of a sewing machine according to claim 4 equipped with a thread length controller which adjusts said predetermined thread length.

[Claim 6] Exchange thread cash-drawer equipment of a sewing machine characterized by providing the following The threader section which pulls out exchange thread connected by amputation stump section [of former thread cut in a thread path between a bobbin and a pinholing], and thread cash-drawer edge side from a bobbin side by pulling out said former thread from said pinholing, and lets it pass to a pinholing The thread cutting section which leaves predetermined length and cuts thread after this threader and said pinholing passage from said pinholing Thread with which it was cut off after this cutting is attracted, and is collected and cut off, and it is a thread stripping section.

[Claim 7] Exchange thread connected by amputation stump section [of former thread cut in a thread path between a bobbin and a pinholing], and thread cash-drawer edge side It has the threader section which pulls out from a bobbin side by pulling out said former thread from said pinholing, and it lets pass to a pinholing. This threader section Exchange thread cash-drawer equipment of a sewing machine equipped with the positioning section which catches a portion of former thread after said connection passed [pinholing] in the prehension section, drives this prehension section, pulls out said former thread from said pinholing, catches the pinholing side edge section of said former thread, and positions former thread prehension by said prehension section.

[Claim 8] Exchange thread cash-drawer equipment of a sewing machine characterized by providing the following The threader section which pulls out exchange thread connected by amputation stump section [of former thread cut in a thread path between a bobbin and a pinholing], and thread cash-drawer edge side from a bobbin side by pulling out said former thread from said pinholing, and lets it pass to a pinholing The thread cutting section which leaves predetermined length and cuts thread [finishing / said pinholing passage] from said pinholing after this threader The positioning section which catches the pinholing side edge section of said former thread, sets a flow direction constant, gives predetermined tension to thread [finishing / said pinholing passage], and positions for said cutting

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] After this invention connects the thread cash-drawer edge side of exchange thread the amputation stump section side of the former thread after cutting using a predetermined needle-thread swap device in the thread path between a bobbin and a pinholing, it pulls out the former thread after this connection from a pinholing, pulls out exchange thread from a bobbin side, and relates to a pinholing at the exchange thread cash-drawer equipment of the sewing machine through and for having and exchanging needle threads.

[0002]

[Description of the Prior Art] A needle thread is cut in the thread path between a bobbin and a pinholing, and it is indicated by JP,3-5834,B etc. about the needle-thread swap device which connects the thread cash-drawer edge side of exchange thread the amputation stump section side of the former thread after this cutting.

[0003] Moreover, exchange thread is pulled out from a bobbin side by pulling out former thread from a pinholing after connection between former thread and exchanged thread, through and this pulled-out former thread portion are cut to a pinholing, and it is indicated by JP,5-179560,A etc. about the exchange thread cash-drawer equipment for which a needle thread is exchanged.

[0004]

[Problem(s) to be Solved by the Invention] However, there were the following problems in the above-mentioned Prior art.

[0005] Namely, if exchange thread tends to be pulled out from a bobbin side by pulling out former thread from a pinholing following on it and it is going to let it pass to a pinholing when connection of both thread goes wrong the amputation stump section side of the former thread after cutting at the connection production process by the side of the thread cash-drawer edge of exchanged thread Only former thread will be pulled out from a pinholing and pulls out exchange thread from a bobbin. If sewing by subsequent exchange thread is started before having to do the activity which carries out the threader of the inside of predetermined thread paths established, such as stitch balancing thread tension and a balance, to a pinholing by handicraft and doing this activity While a blind stitch has not been formed by it, a needle location will be made, a needle-location location will have to be returned to the original location, complicated rehabilitation works, such as a threader of exchange thread, will have to be performed, and sewing working efficiency will be reduced.

[0006] Then, after connection between former thread and exchange thread, the purpose of this invention pulls out exchange thread from a bobbin side by pulling out former thread from a pinholing, and sets it to a pinholing to the exchange thread cash-drawer equipment of through and the sewing machine for which it has and a needle thread is exchanged. Even when connection between former thread and exchange thread goes wrong, a subsequent rehabilitation work is easy and is to have and offer the exchange thread cash-drawer equipment of a sewing machine with high sewing working efficiency.

[0007] If there are few amounts of drawers from the pinholing of thread, it becomes impossible

moreover, to perform sewing in exchange thread after thread exchange after connection between former thread and exchange thread as another technical problem in pulling out former thread from a pinholing and letting exchange thread pass to a pinholing, without exchange thread reaching to a pinholing. On the contrary, if it pulls out too much, from a pinholing, exchange thread will be pulled out superfluously and will be consumed vainly.

[0008] Then, another purpose of this invention is to offer the exchange thread cash-drawer equipment of a sewing machine which can pull out exchange thread from a bobbin side and can prevent useless consumption of the positive exchange to exchange thread, and exchange thread after connection between former thread and exchange thread in the exchange thread cash-drawer equipment of through and the sewing machine for which it has and a needle thread is exchanged to a pinholing by pulling out former thread from a pinholing.

[0009] In connecting former thread and exchange thread in the thread path to a pinholing, pulling out former thread from a pinholing as another technical problem, and letting exchange thread pass to a pinholing, the node of said both thread is caught in which location in a thread path, or there is a possibility of becoming big friction at the time of passing a thread path. In especially a pinholing, the danger is high. In having left this, exchange thread does not reach to a pinholing or there is a possibility of producing the thread breakage.

[0010] Then, the node of former thread and exchange thread is caught in a thread path, or serves as big friction, exchange thread does not reach to a pinholing or another purpose of this invention is to offer the exchange thread cash-drawer equipment of a sewing machine which can prevent the situations, such as producing the thread breakage.

[0011] In pulling out exchange thread to a pinholing and cutting a former thread portion as another technical problem, there is a case where he wants to adjust the previous exchange thread length from a pinholing [finishing / pinholing passage] to a request according to the sewing purpose etc.

[0012] Then, another purpose of this invention is to offer the exchange thread cash-drawer equipment of a sewing machine which pulls out exchange thread from a bobbin side by pulling out former thread from a pinholing, and cuts through and the pulled-out former thread portion to a pinholing and which can adjust the previous exchange thread length from a pinholing [finishing / pinholing passage] to a request in the exchange thread cash-drawer equipment of a sewing machine.

[0013] Furthermore, even if another purpose of this invention adjusts the previous exchange thread length from a pinholing [finishing / pinholing passage] to a request, it is to offer the exchange thread cash-drawer equipment of the sewing machine by which former thread does not remain in the point of a pinholing.

[0014] the exchange webbing appearance of a sewing machine which pulls out exchange thread from a bobbin side because another purpose of this invention pulls out former thread from a pinholing, and cuts through and the pulled-out former thread portion to a pinholing -- carrying out -- equipment -- setting -- the breath injury of the former thread after cutting -- it is in the easy thing for which a sewing machine carries out exchange webbing appearance, and equipment is offered.

[0015] Another purpose of this invention is to offer the exchange thread cash-drawer equipment of a sewing machine which ensures prehension of the former thread for pulling out former thread from a pinholing in the exchange thread cash-drawer equipment of a sewing machine which pulls out exchange thread from a bobbin side by pulling out former thread from a pinholing, and lets it pass to a pinholing.

[0016] Another purpose of this invention is to offer the exchange thread cash-drawer equipment of a sewing machine which pulls out exchange thread from a bobbin side by pulling out former thread from a pinholing, and cuts through and the pulled-out former thread portion to a pinholing and which ensures cutting of a former thread portion in the exchange thread cash-drawer equipment of a sewing machine.

[0017]

[Means for Solving the Problem] A corresponding member and a corresponding sign in a gestalt of implementation of invention mentioned later also write in addition and explain above-mentioned The means for solving a technical problem.

[0018] Invention according to claim 1 exchange thread (T2) connected by amputation stump section [of

former thread (T1) cut in a thread path between a bobbin and a pinholing (301)], and thread cash-drawer edge side (T11) (T21) The threader section which pulls out from a bobbin side by pulling out said former thread from said pinholing, and it lets pass to a pinholing (a driver 9 and 11/knuckle 31 of collar gears), When it is detected that this connection was not made to a detecting element (the node detector 15, CPU22) which detects that this connection was not made after connection of said both thread It is exchange thread cash-drawer equipment of a sewing machine equipped with a control section (CPU22) which stops a cash drawer of said former thread twisted in said threader section, and a subsequent sewing activity.

[0019] According to exchange thread cash-drawer equipment of a sewing machine according to claim 1, it detects that former thread and exchange thread were not connected, and since a cash drawer from a pinholing of former thread and a subsequent sewing activity are stopped, only former thread will be pulled out from a pinholing or the situation where the threader of the needle thread is not carried out to a pinholing is prevented.

[0020] Therefore, according to exchange thread cash-drawer equipment of a sewing machine according to claim 1, even when connection between former thread and exchange thread goes wrong, it is easy, and a subsequent rehabilitation work can have and can offer exchange thread cash-drawer equipment of a sewing machine with high sewing working efficiency.

[0021] Invention according to claim 2 exchange thread (T2) connected by amputation stump section [of former thread (T1) cut in a thread path between a bobbin and a pinholing (301)], and thread cash-drawer edge side (T11) (T21) The threader section which pulls out from a bobbin side by pulling out said former thread from said pinholing, and it lets pass to a pinholing (a driver 9 and 11/knuckle 31 of collar gears), It has a detecting element (the node detector 15, CPU22) which detects that this connection was made after connection of said both thread. Said threader section After said connection is detected, it is exchange thread cash-drawer equipment of a sewing machine which is what lets said exchange thread pass to said pinholing by leading a portion of said former thread passed [pinholing] from said pinholing, and pulling out predetermined thread length set up beforehand from said pinholing.

[0022] By according to exchange thread cash-drawer equipment of a sewing machine according to claim 2, detecting connection between former thread and exchange thread, and pulling out from a pinholing predetermined thread length set up beforehand after this detection Since it lets exchange thread pass to a pinholing, the length of exchange thread which former thread is certainly pulled out by accommodation of predetermined thread length from a pinholing, and is pulled out from a pinholing can be prevented from becoming superfluous.

[0023] Therefore, according to exchange thread cash-drawer equipment of a sewing machine according to claim 2, exchange thread cash-drawer equipment of a sewing machine which can prevent useless consumption of positive exchange to exchange thread and exchange thread can be offered.

[0024] Invention according to claim 3 exchange thread (T2) connected by amputation stump section [of former thread (T1) cut in a thread path between a bobbin and a pinholing (301)], and thread cash-drawer edge side (T11) (T21) The threader section which pulls out from a bobbin side by pulling out said former thread from said pinholing, and it lets pass to a pinholing (a driver 9 and 11/knuckle 31 of collar gears), It has the prehension section (a driver 9 and 11/knuckle 31 of collar gears) which catches a portion of said former thread passed [pinholing]. Said threader section It is what pulls out said former thread from said pinholing by driving said prehension section in said seized condition after connection of said both thread. A detecting element which detects fluctuation of tension which said prehension section receives from said former thread during said former thread cash-drawer activity (the rotation sensor 903, the thread thread take-up spring 41, epilogue detector 42', CPU22), When this tension fluctuation changes into a predetermined condition, it is exchange thread cash-drawer equipment of a sewing machine equipped with a control section (CPU22) which stops a cash drawer of said former thread twisted in said threader section, and a subsequent sewing activity.

[0025] According to exchange thread cash-drawer equipment of a sewing machine according to claim 3, a portion of former thread passed [pinholing] is caught in the prehension section. Since a cash drawer of former thread from a pinholing is stopped when fluctuation of tension which pulls out former thread

from a pinholing by driving this prehension section, and the prehension section receives from former thread changes into a predetermined condition. A case where a node of former thread and exchange thread was caught in a thread path, or becomes big friction can be detected as unusual tension fluctuation, and a sewing activity of a cash drawer of former thread from a pinholing or after that can be stopped.

[0026] Therefore, according to exchange thread cash-drawer equipment of a sewing machine according to claim 3, a node of former thread and exchange thread is caught in a thread path, or serves as big friction, exchange thread cannot reach to a pinholing or exchange thread cash-drawer equipment of a sewing machine which can prevent the situations, such as producing thread breakage, can be offered.

[0027] Invention according to claim 4 exchange thread (T2) connected by amputation stump section [of former thread (T1) cut in a thread path between a bobbin and a pinholing (301)], and thread cash-drawer edge side (T11) (T21) The threader section which pulls out from a bobbin side by pulling out said former thread from said pinholing, and it lets pass to a pinholing (a driver 9 and collar gear 11), It is exchange thread cash-drawer equipment of a sewing machine equipped with the thread cutting section (Metz 12) which leaves predetermined length and cuts thread [finishing / said pinholing passage] from said pinholing, and thread length controllers (volume 161, Metz 12, setscrew 122, etc.) which adjust this predetermined thread length left behind after this threader.

[0028] According to exchange thread cash-drawer equipment of a sewing machine according to claim 4, exchange thread cash-drawer equipment of a sewing machine which can adjust the previous exchange thread length from a pinholing [finishing / pinholing passage] to a request can be offered by thread length controller.

[0029] In this case, if a thread length controller (volume 161) which adjusts the cash-drawer length of exchange thread by said threader section is prepared (claim 5), even if it adjusts the previous exchange thread length from a pinholing to a request, former thread will not remain in the point of a pinholing, or will not make exchange thread useless superfluously.

[0030] Invention according to claim 6 exchange thread (T2) connected by amputation stump section [of former thread (T1) cut in a thread path between a bobbin and a pinholing (301)], and thread cash-drawer edge side (T11) (T21) The threader section which pulls out from a bobbin side by pulling out said former thread from said pinholing, and it lets pass to a pinholing (a driver 9 and collar gear 11), It is exchange thread cash-drawer equipment of a sewing machine which attracts and collects the thread cutting section (Metz 12) which leaves predetermined length and cuts thread after this threader and said pinholing passage from said pinholing, and thread with which it was cut off after this cutting and which cut off and is equipped with a thread stripping section (a bulb 144, vacuum generator 149).

[0031] since thread with which a sewing machine according to claim 6 carried out exchange webbing appearance, and it was cut off after cutting according to equipment is attracted and collected -- a breath injury of the remaining thread after cutting -- an easy sewing machine can carry out exchange webbing appearance, and equipment can be offered.

[0032] Invention according to claim 7 exchange thread connected by amputation stump section [of former thread cut in a thread path between a bobbin and a pinholing], and thread cash-drawer edge side It has the threader section (a driver 9 and collar gear 11) which pulls out from a bobbin side by pulling out said former thread from said pinholing, and it lets pass to a pinholing. This threader section A portion of former thread after said connection passed [pinholing] is caught in the prehension section (a driver 9 and collar gear 11). It is exchange thread cash-drawer equipment of a sewing machine equipped with the positioning section (thread clamp 14) which drives this prehension section, pulls out said former thread from said pinholing, catches the pinholing side edge section of said former thread, and positions former thread prehension by said prehension section.

[0033] According to exchange thread cash-drawer equipment of a sewing machine according to claim 7, since the pinholing side edge section of former thread is caught and positioning for former thread prehension by the prehension section is performed, exchange thread cash-drawer equipment of a sewing machine which ensures prehension of former thread for pulling out former thread from a pinholing can be offered.

[0034] Invention according to claim 8 exchange thread (T2) connected by amputation stump section [of former thread (T1) cut in a thread path between a bobbin and a pinholing (301)], and thread cash-drawer edge side (T11) (T21) The threader section which pulls out from a bobbin side by said pinholing to said former thread drawer ***** , and it lets pass to a pinholing (a driver 9 and collar gear 11), The thread cutting section which leaves predetermined length and cuts thread [finishing / said pinholing passage] from said pinholing after this threader (Metz 12), It is exchange thread cash-drawer equipment of a sewing machine which caught the pinholing side edge section (T12) of said former thread, set a flow direction constant, gave predetermined tension to thread [finishing / said pinholing passage], and is equipped with the positioning section (thread clamp 14) which positions for said cutting.

[0035] According to exchange thread cash-drawer equipment of a sewing machine according to claim 8, since the pinholing side edge section of former thread is caught, a flow direction can be set constant, predetermined tension can be given to thread [finishing / pinholing passage] and it can position for cutting by the side of former thread, exchange thread cash-drawer equipment of a sewing machine which ensures cutting of a former thread portion can be offered.

[0036]

[Embodiment of the Invention]

[Gestalt 1 of implementation of invention] A configuration is explained first.

[0037] Drawing 1 is the perspective diagram of the exchange thread cash-drawer equipment 1 which is the gestalt 1 of implementation of this invention.

[0038] A sign 2 is an automatic sewing sewing machine, and exchange thread cash-drawer equipment 1 is formed in the head of this sewing machine.

[0039] Although detailed explanation is omitted, a predetermined needle-thread swap device (illustration abbreviation) is formed in the automatic sewing sewing machine 2, and this needle-thread swap device cuts a needle thread in the thread path between a bobbin (illustration abbreviation) and the pinholing 301 of a needle 3, and connects the thread cash-drawer edge side T21 of exchange thread T2 the amputation stump section side T11 of the former thread T1 after this cutting. What is indicated by JP,3-5834,B etc. as a needle-thread swap device 2 can be used. A sign T0 is the node of both thread T1 and T2.

[0040] The pinholing 301 lets former thread T1 pass through the predetermined thread path. The balance 6 is formed in this thread path at stitch balancing thread tension 4; tension thread guards 501, 502, and 503, and 504 lists. A sign 7 is a needle bar and is a presser foot while a sign 8 is interlocked with a needle location and carrying out vertical reciprocation with a predetermined drive.

[0041] It is fixed to a shaft 901 and a driver 9 is rotated with a drive motor 902. The rotation sensor 903 (it sets to drawing 1 and is an illustration abbreviation) which detects the angle of rotation of the axis of rotation of this motor is formed in the drive motor 902. The collar gear 11 is attached in the end side of the drive arm 111 free [rotation] with the shaft 112. The end side of the shaft 114 currently supported to revolve free [the rotation to bearing 113] is attached in the other end side of the drive arm 111. The end side of a lever 115 is attached in the other end side of a shaft 114, and the other end side is connected with the cylinder rod of an air cylinder 117 through the knuckle 116. It rotates in the direction of **** a by the drive of a cylinder 117, and a collar gear 11 is engaged with a driver 9, or the drive arm 111 evacuates it from a driver 9 side.

[0042] Thread-cutter Metz 12 is attached in the cylinder rod of an air cylinder 121, and it goes up and down it in the direction of **** b by the drive of this air cylinder. Moreover, the point location of Metz 12 can be adjusted in the direction of **** c by a setscrew's 122 ****ing and adjusting a stop location.

[0043] A sign 13 is a wiper which wipes a needle thread. It is attached in the end side of the shaft 131 currently supported to revolve by the sewing-machine frame free [rotation], and the end side of a lever 132 is being fixed to the other end side by the end face side of this wiper. With the shaft 134, the end side of the wiper arm 133 is attached free [rotation], and is attached in the other end side of a lever 132 free [rotation] with the shaft 136 at the end side of the drive lever 135 at the other end side of the wiper arm 133. The drive lever 135 is connected with the wiper solenoid 138 with the shaft 137. A wiper 13 moves in the direction of **** d by the drive of the wiper solenoid 138.

[0044] A sign 14 is a thread clamp, and in this thread clamp, the clamp section 142 and the ball 143

which are driven by the air cylinder 141 are prepared, and it clamps the margin of string with the clamp section 142 and a ball 143. Moreover, a bulb 144 is connected to the thread clamp 14, and the margin of string is attracted by suction of the air from this bulb 144. The thread clamp 14 is attached in the end side of the drive arm 145. The mid-position of the drive arm 145 is attached in the sewing-machine frame free [rotation] with the shaft 146. The other end side of the drive arm 145 is connected with the cylinder rod of an air cylinder 148 through the knuckle 147. By the drive of an air cylinder 148, the drive arm 145 is rotated in the direction of **** e.

[0045] From the stitch balancing thread tension 4 of the thread path of a needle thread, a sign 15 is a thread node detector (photosensor) formed in the thread cash-drawer side, and detects a node T0. A sign 16 is an electrical box and the timer accommodation volume 161 for adjusting the resistance welding time to a motor 902 by manual actuation is formed in the electrical box 16.

[0046] A sign 17 is a feed bar prepared on the sewing-machine base. The presser foot 171 is formed in this feed bar, and this presser foot holds the sewing 18-ed. A feed bar 17 moves in the direction of X-Y in a predetermined movable table top, and sends the sewing 18-ed in the direction of X-Y on a throat plate 172. This delivery actuation is performed according to X-Y coordinate data contained in predetermined sewing data, on the sewing 18-ed sent in this way, it is carrying out a needle location and predetermined configuration sewing is performed. Since these are common knowledge technology, the detailed explanation beyond this is omitted.

[0047] Next, the configuration of the control system of exchange thread cash-drawer equipment 1 is explained.

[0048] Drawing 2 is the block diagram showing the configuration of the control system of exchange thread cash-drawer equipment 1.

[0049] As shown in this drawing, in the electrical box 16, it has the sewing-machine control unit 19. This sewing-machine control unit is equipped with a predetermined floppy disk drive, and in order to give predetermined configuration sewing based on the predetermined sewing data stored in the floppy disk 21, it controls each part of a sewing machine 2. That is, configuration sewing of a request is given by carrying out a needle location, controlling the drive of the normal axis (illustration abbreviation) of the sewing machine 2 by the feed bar 17 and the sewing-machine motor etc., and driving a feed bar 17 in the direction of X-Y based on the predetermined sewing data stored in the floppy disk 21. The sewing-machine control unit 19 outputs a webbing appearance start signal to the webbing appearance control section 22.

[0050] ROM23 and RAM24 are connected to the webbing appearance control section (CPU) 22. The predetermined control program for controlling each part for needle-thread exchange etc. is stored in ROM23.

[0051] The webbing appearance control section 22 outputs a sewing-machine stop signal and a webbing appearance terminate signal to the sewing-machine control unit 19. Moreover, the webbing appearance control section 22 sends and controls a control signal to solenoid valves SV1-SV5. These solenoid valves SV1-SV4 operate supply of the air to said air cylinders 117, 148, 141, and 121 respectively. Moreover, a solenoid valve SV 5 is formed in said bulb 144 which has connected the vacuum generator 149 which attracts the air in said thread clamp 14, and opens and closes a bulb 144. The vacuum generator 149 is formed in said electrical box 16. The webbing appearance control section 22 sends a control signal to the solenoid driver 139 which drives said solenoid 138, and controls a solenoid 138. Moreover, the webbing appearance control section 22 sends a control signal to Motor Driver 904 which drives said drive motor 902, and controls a motor 902. Furthermore, the detecting signal from said thread epilogue detector 15 and said rotation sensor 903 formed in the motor 902 is inputted into the webbing appearance control section 22.

[0052] Next, an operation is explained.

[0053] Below, it explains with reference to the cross section of the flow chart of drawing 3 and drawing 4, drawing 5 - drawing 7, drawing 9, drawing 13 and the perspective diagram of **14**, drawing 8, and drawing 10.

[0054] The needle location of it is carried out, and drawing 5 forms blind stitch T3, sending the sewing

18-ed in the direction of X-Y by delivery 172, and shows the condition of having performed the predetermined thread cutter. The needle thread used for formation of blind stitch T3 is the same thread pulled out from the same bobbin as former thread T2. The margin of string T31 of blind stitch T3 behind a thread cutter is in the condition of having been cut with the throat-plate 172 down side. At this time, a driver 9 and a collar gear 11 are in the condition of having geared. Although not shown in drawing 5, former thread T1 is cut from the stitch balancing thread tension 4 of the thread path between a pinholing 301 and a bobbin (illustration abbreviation) in the predetermined location by the side of a bobbin in this phase, and the thread epilogue of the thread cash-drawer edge side T21 of that amputation stump section side T11 and other exchange thread T2 is carried out with (refer to drawing 1) and the aforementioned needle-thread swap device.

[0055] The sewing-machine control unit 19 will output a webbing appearance start signal to CPU22, if actuation of said thread epilogue is made with said needle-thread swap device.

[0056] If CPU22 receives a webbing appearance start signal as shown in drawing 3 (step S1), as a control signal is outputted to a solenoid valve SV 1, a cylinder 117 is driven and it is shown in drawing 6, the cylinder rod will be moved in the direction of **** f, engagement with the driver 9 of a collar gear 11 will be released, and it will evacuate in the direction of **** g (step S2).

[0057] Next, as a control signal is transmitted to a solenoid valve SV 2 and it is shown in drawing 7, the cylinder rod of a cylinder 148 is moved in the direction of **** h, the drive arm 145 is rotated in the direction of **** i, and the thread clamp 14 is moved near the pinholing 301 (step S3). As the thread clamp 14 interior at this time shows to drawing 8, the clamp section 142 is in the condition of having evacuated to the cylinder 141 side, and its ball 143 is free within the thread clamp 141.

[0058] Then, as shown in delivery and drawing 9, the drive lever 135 is rotated for a control signal in the direction of **** j by SORENOITO 138 to a solenoid driver 139, a wiper 13 is rotated in the direction of **** k, and the former thread T12 of the point of a pinholing 301 is drawn in to the thread clamp 14 side (step S4). As a control signal is outputted to a solenoid valve SV 5 and it is shown in drawing 10 in this condition Attract air in the direction of **** l from a bulb 144, and the margin of string T12 is attracted in the thread clamp 14. Then, output a control signal to a solenoid valve SV 3, and a cylinder 141 is driven. It moves in the direction of **** m in the tip of the clamp section 142, a ball 143 is pressed, the margin of string T12 is clamped between a ball 143 and the wall of the thread clamp 14, a control signal is outputted to a solenoid valve SV 3, and suction of said air stops (step S5).

[0059] Next, to a solenoid valve SV 2, as shown in delivery and drawing 11, a cylinder 148 is driven for a control signal, the drive arm 145 is rotated in the direction of **** n, and former thread T1 is led in the direction of **** p by the thread clamp 14. And a control signal is outputted to a solenoid valve SV 1, a cylinder 117 is driven, the drive arm 111 is rotated in the direction of **** o, a driver 9 and a collar gear 11 are engaged again, and former thread T1 is pinched. Moreover, a control signal is outputted to a solenoid driver 139, a solenoid 138 is driven, a wiper 13 is rotated in the direction of **** q, and it returns to the original location (step S6).

[0060] And a control signal is outputted to a solenoid valve SV 3, the clamp section 142 is returned to a cylinder 141 side, and a ball 143 is made free, and a control signal is outputted to a solenoid valve SV 5, and the air from a bulb 144 is attracted (step S7). Since there is suction of air even if it makes a ball 143 into Flea, the former margin-of-string section T12 does not fall out from the thread clamp 14.

[0061] As it is, as a control signal is outputted to Motor Driver 904, a drive motor 902 is driven and it is shown in drawing 12, a driver 9 is rotated in the direction of **** r, and a collar gear 11 rotates in the direction of **** s in connection with this. Former thread T1 is pulled out by this gear pair of element from a pinholing 301 (step S8). The former thread T1 pulled out is attracted in the bulb 144.

[0062] After motor 902 drive initiation, if predetermined time progress is carried out, a motor 902 will be suspended (step S8 [it mentions later]). Then, as a control signal is outputted to a solenoid valve SV 4 and it is shown in drawing 13, a cylinder 121 is driven, the needle thread which descended in the direction of **** u and pulled out Metz 12 in it is cut, and a thread cutter is performed (step S9). In addition, let the aforementioned predetermined time (after-mentioned) which drives a motor 902 be the degree which can perform the cash drawer of said thread to the degree to which former thread T1 does

not remain in the needle thread currently pulled out from the pinholing 301 after cutting at the time of this thread cutter, and the length of the exchange thread T2 in the remaining thread after cutting does not become long vainly (that is desirable). The remaining thread after cutting is attracted and discharged by the bulb 144, and Metz 12 is returned to the original location by the drive of a cylinder 121. In addition, by adjusting the bolting location of a setscrew 122, the location of Metz 12 can be adjusted and the length of previous exchange thread T2 can be adjusted from the pinholing 301 behind a thread cutter.

[0063] After this thread cutter, CPU22 outputs a webbing appearance terminate signal to the sewing-machine control unit 19 (step S10), the drawer activity of exchange thread is ended, and a sewing machine 2 resumes predetermined sewing according a webbing appearance terminate signal to exchange thread T2 by control of the carrier beam sewing-machine control unit 19.

[0064] The drawer production process (step S8) of said former thread is explained.

[0065] At this production process, as aforementioned, a motor 902 is driven [aforementioned] until it carries out predetermined time progress, and the needle thread of predetermined length is pulled out from a pinholing 301. And detection of tension is performed the above of detection of a node T0, and former thread T2 in the predetermined time which drives a motor 902, and predetermined actuation is performed based on these.

[0066] A motor 902 is suspended, when the tension value set up beforehand is exceeded as shown in drawing 4 when the cash drawer of former thread T1 was started (step S11) and the fluctuation of tension which a driver 9 receives from former thread T1 changes into a predetermined condition from the detecting signal of the rotation sensor 903 for example, (step S12, step S13). In this case, after an operator takes predetermined check and measures, he operates the predetermined resumption switch of operation, resumes the drive of a motor 902 (step S14), does manual actuation of the drive time amount of a motor 902, pulls out the needle thread of the desired length (step S15), and ends.

[0067] When having not passed, it progresses to step S12 by judging whether when not detecting abnormality tension at step S12, the predetermined short time set up beforehand passed after drawer initiation (step S11) of said former thread T1 (step S16), and return and when having passed, it progresses to step S17.

[0068] At step S17, it judges whether former thread T1 and exchange thread T2 were connected with whether within the aforementioned short time, former thread T1 was pulled out and the node T0 of former thread T1 and exchange thread T2 was detected by the thread node detector 15, and said needle-thread swap device. When the node T0 is not formed, a motor 902 is suspended immediately (step S18). It is made for the cash drawer of former thread T1 to stop the aforementioned short time and the timing of motor 902 halt, just before the edge T11 of former thread T1 passes stitch balancing thread tension 4 (that is desirable). This connects the margin-of-string section T11 and the exchange margin-of-string section T21 which have been stopped before stitch balancing thread tension 4 by handcraft, a predetermined restart switch is operated, the drive of a motor 902 is resumed (step S19), manual actuation of the drive time amount of a motor 902 is carried out, the needle thread of the desired length is pulled out (step S20), and it ends.

[0069] When a node T0 is detected at step S17, it progresses to step S21. At step S21, when the fluctuation of tension which a driver 9 receives from former thread T1 changes the same into a predetermined condition from the detecting signal of the rotation sensor 903 in said step S12, a motor 902 is suspended (step S21, step S22). Similarly, after [said] an operator takes predetermined check and measures, he operates the predetermined resumption switch of operation (step S23), does manual actuation of the drive time amount of a motor 902, pulls out the needle thread of the desired length (step S24), and ends.

[0070] When the predetermined time (it describes above by explanation of step S9) which maintained the drive of a motor 902 and was beforehand set up after motor 902 drive initiation (step S11) when the abnormality tension of former thread T1 was not detected at step S21 passes, (step S25) and a motor 902 are suspended and the cash drawer of former thread T1 is stopped (step S26).

[0071] Moreover, the aforementioned predetermined time (step S25) set up beforehand can carry out manual accommodation in volume 161 (refer to drawing 1).

[0072] In addition, the thread node detector (photosensor) 15 adjusts light-receiving volume and operational-amplifier RIFA (neither is illustrated) beforehand so that width of face of thread 1 usual duty may not be incorrect-detected with a node T0.

[0073] According to the exchange thread cash-drawer equipment 1 explained above, a detector 15 detects that former thread T1 and exchange thread T2 were not connected. Since the cash drawer from the pinholing 301 of former thread T1 is stopped, only former thread T1 will be pulled out from a pinholing. The situation which carries out the threader of the exchange thread T2 to a predetermined thread path manually to a pinholing 301 is prevented (since the exchange margin-of-string section T21 is before stitch balancing thread tension 4 in the above-mentioned example, connection of both the thread T1 and T2 by handicraft is also easy). Moreover, since a subsequent sewing activity is not done, either, unless a predetermined restart switch is operated, the situation where sewing is made with no exchange thread T2 is also prevented. Therefore, even when connection between former thread T1 and exchange thread T2 goes wrong, it is easy, and a subsequent rehabilitation work can have and can offer exchange thread cash-drawer equipment with high sewing working efficiency.

[0074] Moreover, since the cash drawer of a needle thread is made into predetermined length by making the drive of a motor 902 into the inside of the predetermined time set up beforehand (step S25, step S26) if the node T0 at the time of a drive halt of a motor 902 is adjusted so that it may become suitable locations (location beyond a little Metz 12 descent location etc.) -- the needle thread behind a thread cutter (step S9) -- former thread T1 -- all -- moreover, exchange thread T2 is not superfluously made useless

[0075] Furthermore, when pulling out former thread T1 from a pinholing 301 and the unusual tension fluctuation from former thread T1 is detected Since the drive of a motor 902 is stopped (step S12, step S13, step S21, step S22) The case where the node T0 of former thread T1 and exchange thread T2 was caught in the thread path, or becomes big friction can be detected as unusual tension fluctuation, and the cash drawer of the former thread from a pinholing can be stopped. Therefore, exchange thread T2 cannot reach to a pinholing 301 for these reasons, or the situations, such as producing the thread breakage, can be prevented. Moreover, a needle location will not be carried out without a needle thread, if a subsequent sewing activity is also made not to be done unless a restart switch (not shown) is operated.

[0076] The thread-cutter location by Metz 12 can be adjusted with a setscrew 122, and since the aforementioned predetermined time (step S25) set up beforehand can carry out manual accommodation in volume 161 (refer to drawing 1), it can adjust the length of previous exchange thread T2 from the pinholing [finishing / pinholing 301 passage] 301 to a request by these accommodation. Moreover, by these accommodation, former thread T1 does not remain in previous exchange thread T2 from a pinholing 301 after a thread cutter, or exchange thread T2 is not superfluously made useless.

[0077] since the remaining thread behind a thread cutter is attracted by the bulb 144 and it is collected -- the breath injury of the remaining thread -- it is easy.

[0078] Since pinching of the former thread T1 by the driver 9 and the collar gear 11 is performed by clamping and positioning the former margin-of-string section T12 by the thread clamp 14, it can ensure prehension of the former thread T1 for pulling out former thread T1 from a pinholing 301.

[0079] Since the needle-thread end by Metz 12 can set constant the flow direction of a needle thread [finishing / pinholing 301 passage], can give predetermined tension and can position for cutting by clamping the former margin-of-string section T12 by the thread clamp 14, and carrying out constant-rate evacuation of the drive arm 145, it can ensure cutting of the needle thread containing former thread T1 portion by descending Metz 12.

[0080] In addition, the above-mentioned exchange thread cash-drawer equipment 1 cannot be overemphasized, and does not limit this invention. For example, a thread node detector (photosensor) is formed also in the mid-position (****v) of the thread path between the driver 9 and collar gear 11 in drawing 13 , and the drive thread clamp 14, and after detecting a node T0 in the location concerned, a cylinder 121 is driven and it may be made to perform the thread cutter by Metz 12.

[0081] Moreover, in the above-mentioned example, the node detector 15 is used as a means to detect the existence of the connection for the connected former thread T1 and exchange thread T2 during a thread

cash-drawer activity.

[0082] this -- replacing with -- drawing 18 -- being shown -- as -- common knowledge -- stitch balancing thread tension -- four -- ' -- this -- stitch balancing thread tension -- four -- ' -- building -- having had -- thread -- being engaged -- while -- thread -- a drawer -- an activity -- following -- rocking -- a thread take-up spring -- 41 -- ' -- predetermined -- thread -- an epilogue -- detectors (microswitch etc.) -- 42 -- ' -- using -- the existence of connection between former thread T1 and exchange thread T2 -- detecting -- you may make . In addition, sign 43' is a thread engagement member with which thread engages.

[0083] In this case, since the force which thread-take-up-spring 41' receives from thread is not necessarily fixed, it is also considered that detection of the thread epilogue by thread epilogue detector 42' is not temporarily made even if the thread epilogue is made.

[0084] Then, although a node T0 reaches from a thread epilogue location just before stitch-balancing-thread-tension 4', supposing a motor 902 rotates eight times, for example Detect rotation of a motor 902 by the rotation sensor 903, and 0 N (those with a thread epilogue) of the switch of ** which rotates one time, and OFF (with no thread epilogue) are counted with a predetermined counter. For example, what is necessary is just to make it judge that the thread epilogue is not made for 4 or less times by which the thread epilogue is made among 8 times, if 5 times or more are OFF.

[0085] [Gestalt 2 of implementation of invention] Drawing 14 is the perspective diagram of exchange thread cash-drawer equipment 1' which is the gestalt 2 of implementation of this invention.

[0086] A sign 2 is an automatic sewing sewing machine, and exchange thread cash-drawer equipment 1' is prepared in the head of this sewing machine. The member of the same sign as drawing 1 - drawing 13 is the same member as said exchange thread cash-drawer equipment 1, and detailed explanation is omitted.

[0087] First, a configuration is explained.

[0088] First, the point that exchange thread cash-drawer equipment 1' is different from exchange thread cash-drawer equipment 1 forms an air cylinder 311 in the head of a sewing machine 2, and is fixing the motor 314 to anchoring and the other end for the end section of the drive arm 313 through a knuckle 312 at the cylinder rod of this air cylinder. Furthermore, the drive arm 313 is attached free [rotation] to the sewing-machine head in the mid-position of a longitudinal direction through the rocking lever shaft 315. The knuckle 31 by which slots 316 and 316 are formed in the point is formed in the motor shaft of a motor 55.

[0089] This knuckle 31 is not replaced with the driver 9 in the gestalt 1 of implementation of invention, and a collar gear 11, and the thread clamp 14, wipers 13, and these already explained drives are not formed, either. A sign 32 is Metz which performs the needle-thread end, and a sign 321 is an air cylinder which drives this Metz.

[0090] Next, an operation is explained.

[0091] First, the thread epilogue of former thread T1 and the exchange thread T2 is carried out by the swap device of said needle thread in the condition before [of 1-several stitches] a sewing machine 2 starts thread-cutter actuation, and thereby, a sewing machine 2 starts thread-cutter actuation, and cuts former thread T1 from blind stitch T3.

[0092] The condition at this time is drawing 14 . Next, as shown in drawing 15 , the drive arm 313 is rotated in the direction of **** w by the drive of a cylinder 311. Thereby, a knuckle 31 moves to the needle point of a needle 3, and the edge T12 of former thread engages with the slot 316. And if a knuckle 31 is rotated in the **** x direction by the motor 314, a needle thread is rolled round by the amount of [of a knuckle 31] periphery, and as shown in drawing 16 , former thread T1 can be pulled out from a pinholing 301 by rotating the drive arm 313 and returning a knuckle 31 to the original location. Then, the drawer activity of exchange thread T2 can be done by cutting in Metz 12 like the gestalt 1 of implementation of a needle thread of said invention.

[0093] According to exchange thread cash-drawer equipment 1' explained above, like exchange thread cash-drawer equipment 1 The former margin-of-string section T12 is clamped by the thread clamp 14. Carry out the cash drawer of former thread T1, and positioning of a thread cutter, or It is not necessary to make easy the thread clamp by the thread clamp 14 by the wiper 13, and since the cash drawer of

former thread T1 and positioning of a thread cutter can perform a knuckle 31 in operating, they are components mark smaller than exchange thread cash-drawer equipment 1. Exchange thread cash-drawer equipment with a low manufacturing cost can be offered.

[0094] Moreover, even if a detector 15 detects a node and it cannot perform connection between former thread T1 and exchange thread T2 like exchange thread cash-drawer equipment 1, it has it, using a subsequent rehabilitation work as easy, and you may make it raise sewing working efficiency.

[0095] The cash drawer of a needle thread is made into predetermined length like the inside of the predetermined time beforehand set up in the drive of a motor 314, then exchange thread cash-drawer equipment 1. if the node T0 at the time of a drive halt of a motor 314 is adjusted so that it may become suitable locations (location beyond a little Metz 12 descent location etc.) -- the needle thread behind a thread cutter -- former thread T1 -- all -- moreover, exchange thread T2 is not superfluously made useless

[0096] If said rotation sensor 903 detects rotation of a motor 314 When the unusual tension fluctuation from former thread T1 is detected, the drive of a motor 314 is stopped. The node T0 of former thread T1 and exchange thread T2 is caught in a thread path, or The case where it becomes big friction can be detected as unusual tension fluctuation, the cash drawer of the former thread from a pinholing can be stopped, and exchange thread T2 cannot reach to a pinholing 301, or can also prevent the situations, such as producing the thread breakage. Moreover, if it is made for there to be also no restart of a drive of a motor 314 in this case unless a restart switch is operated, a subsequent sewing activity will not be done, either and a needle location will not be carried out without a needle thread.

[0097] If Metz 32 is constituted possible [modification of a rise-and-fall location] like said Metz 12 and it can be made to carry out in volume 161 (to refer to drawing 1) manual accommodation of the drive time amount of a motor 314, the length of previous exchange thread T2 can be adjusted from the pinholing [finishing / pinholing 301 passage] 301 to a request. Moreover, by these accommodation, former thread T1 does not remain in previous exchange thread T2 from a pinholing 301 after a thread cutter, or exchange thread T2 is not superfluously made useless.

[0098] Although thread remains having remained in the knuckle 31 and twisted, handicraft may remove at the time of the next thread exchange, and it collects after that thread exchange how many times, and you may make it remove after a thread cutter.

[0099]

[Effect of the Invention] According to invention according to claim 1, even when connection between former thread and exchange thread goes wrong, it is easy, and a subsequent rehabilitation work can have and can offer the exchange thread cash-drawer equipment of a sewing machine with high sewing working efficiency.

[0100] According to invention according to claim 2, the exchange thread cash-drawer equipment of a sewing machine which can prevent useless consumption of the positive exchange to exchange thread and exchange thread can be offered.

[0101] According to invention according to claim 3, the node of former thread and exchange thread is caught in a thread path, or serves as big friction, exchange thread cannot reach to a pinholing or the exchange thread cash-drawer equipment of a sewing machine which can prevent the situations, such as producing the thread breakage, can be offered.

[0102] According to invention according to claim 4, the exchange thread cash-drawer equipment of a sewing machine which can adjust the previous exchange thread length from a pinholing [finishing / pinholing passage] to a request can be offered by the thread length controller.

[0103] According to invention according to claim 5, even if it does so the same effect as invention according to claim 4 and also adjusts the previous exchange thread length from a pinholing [finishing / pinholing passage] to a request, the exchange thread cash-drawer equipment of a sewing machine which can prevent useless consumption of the positive exchange to exchange thread and exchange thread can be offered.

[0104] according to invention according to claim 6 -- the breath injury of the remaining thread after cutting -- an easy sewing machine can carry out exchange webbing appearance, and equipment can be

offered.

[0105] According to invention according to claim 7, the exchange thread cash-drawer equipment of a sewing machine which ensures prehension of the former thread for pulling out former thread from a pinholing can be offered.

[0106] According to invention according to claim 8, the exchange thread cash-drawer equipment of a sewing machine which ensures cutting of a former thread portion can be offered.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

- [Drawing 1] The perspective diagram of the exchange thread drawer equipment which is the gestalt 1 of implementation of this invention.
- [Drawing 2] The block diagram showing the configuration of the control system of the exchange thread drawer equipment which is the gestalt 1 of implementation of this invention.
- [Drawing 3] The flow chart explaining an operation of the exchange thread drawer equipment which is the gestalt 1 of implementation of this invention.
- [Drawing 4] The flow chart explaining an operation of the exchange thread drawer equipment which is the gestalt 1 of implementation of this invention.
- [Drawing 5] The perspective diagram explaining an operation of the exchange thread drawer equipment which is the gestalt 1 of implementation of this invention.
- [Drawing 6] The perspective diagram explaining an operation of the exchange thread drawer equipment which is the gestalt 1 of implementation of this invention.
- [Drawing 7] The perspective diagram explaining an operation of the exchange thread drawer equipment which is the gestalt 1 of implementation of this invention.
- [Drawing 8] The cross section of the thread clamp of the exchange thread drawer equipment which is the gestalt 1 of implementation of this invention.
- [Drawing 9] The perspective diagram explaining an operation of the exchange thread drawer equipment which is the gestalt 1 of implementation of this invention.
- [Drawing 10] The cross section of the thread clamp of the exchange thread drawer equipment which is the gestalt 1 of implementation of this invention.
- [Drawing 11] The perspective diagram explaining an operation of the exchange thread drawer equipment which is the gestalt 1 of implementation of this invention.
- [Drawing 12] The perspective diagram explaining an operation of the exchange thread drawer equipment which is the gestalt 1 of implementation of this invention.
- [Drawing 13] The perspective diagram explaining an operation of the exchange thread drawer equipment which is the gestalt 1 of implementation of this invention.
- [Drawing 14] The perspective diagram of the exchange thread drawer equipment which is the gestalt 2 of implementation of this invention.
- [Drawing 15] The perspective diagram explaining an operation of the exchange thread drawer equipment which is the gestalt 2 of implementation of this invention.
- [Drawing 16] The perspective diagram explaining an operation of the exchange thread drawer equipment which is the gestalt 2 of implementation of this invention.
- [Drawing 17] The perspective diagram explaining an operation of the exchange thread drawer equipment which is the gestalt 2 of implementation of this invention.
- [Drawing 18] The perspective diagram explaining the modification of the exchange thread drawer equipment which is the gestalt 1 of implementation of this invention.

[Description of Notations]

1 Exchange Thread Cash-Drawer Equipment
301 Pinholing
9 Driver
12 Metz
122 Setscrew
14 Thread Clamp
144 Bulb
149 Vacuum Generator
161 Volume
903 Rotation Sensor
11 Collar Gear
15 Node Detector
22 CPU
41' Thread take-up spring
42' Thread epilogue detector
1' Exchange thread cash-drawer equipment
31 Knuckle
T1 Former thread
T11 Former margin-of-string section (bobbin side)
T12 Former margin-of-string section (needle side)
T2 Exchange thread
T21 Exchange margin-of-string section

[Translation done.]

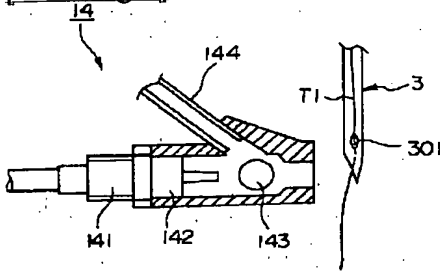
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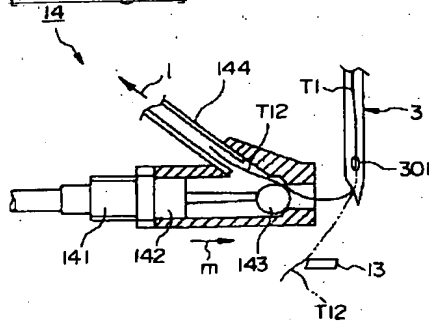
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DRAWINGS

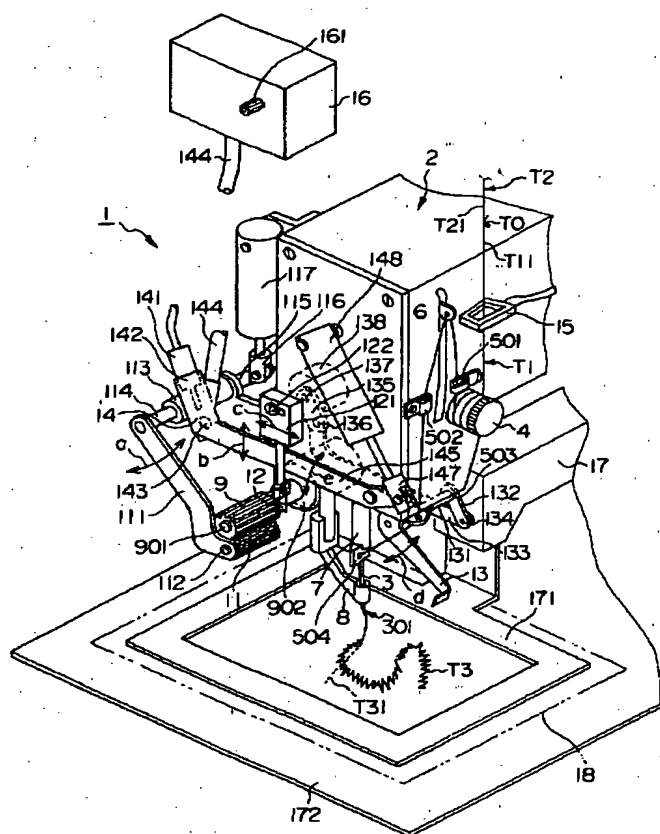
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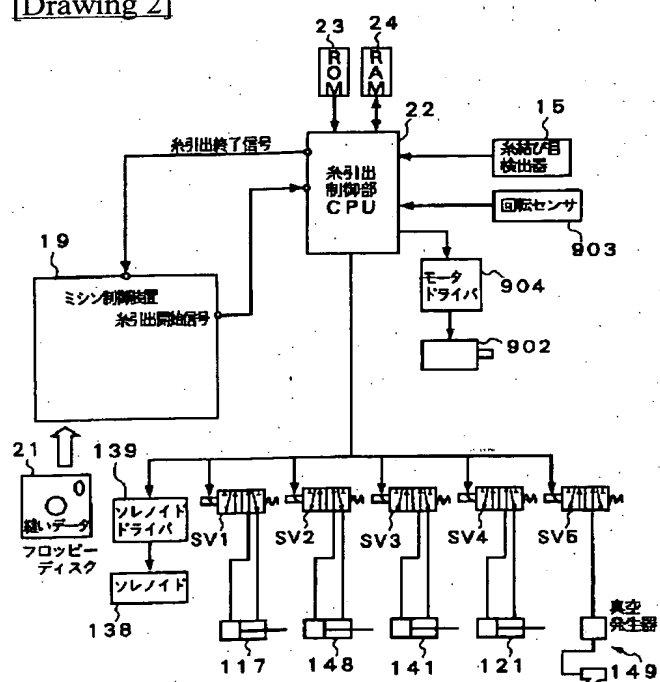
[Drawing 10]



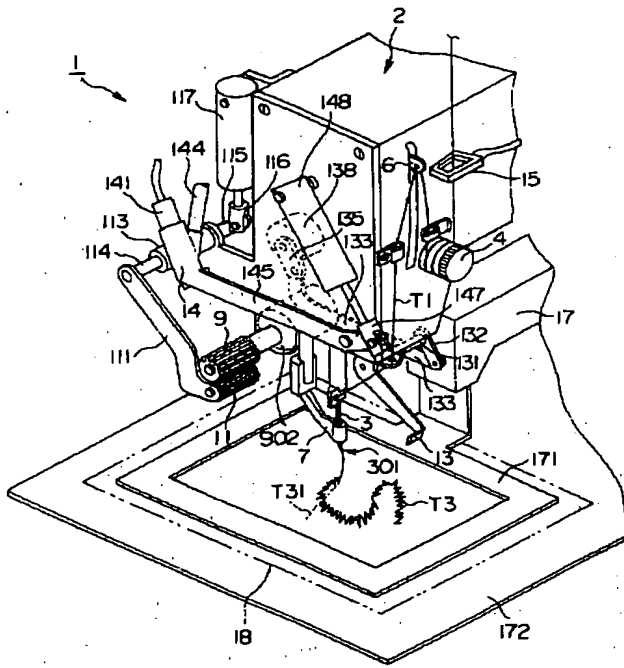
[Drawing 1]



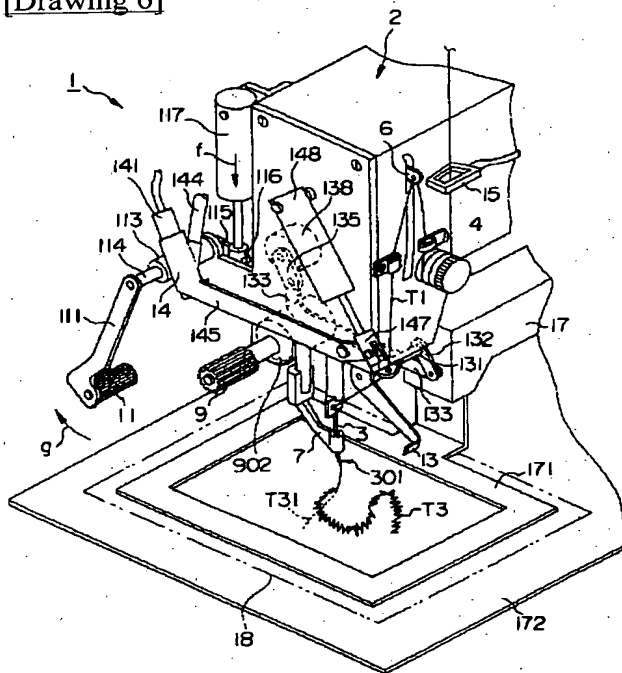
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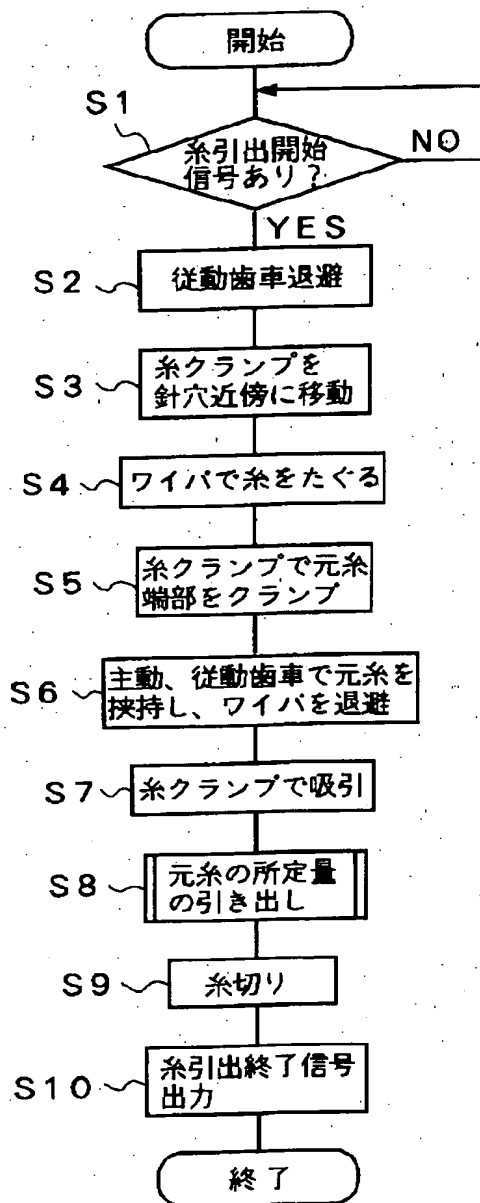
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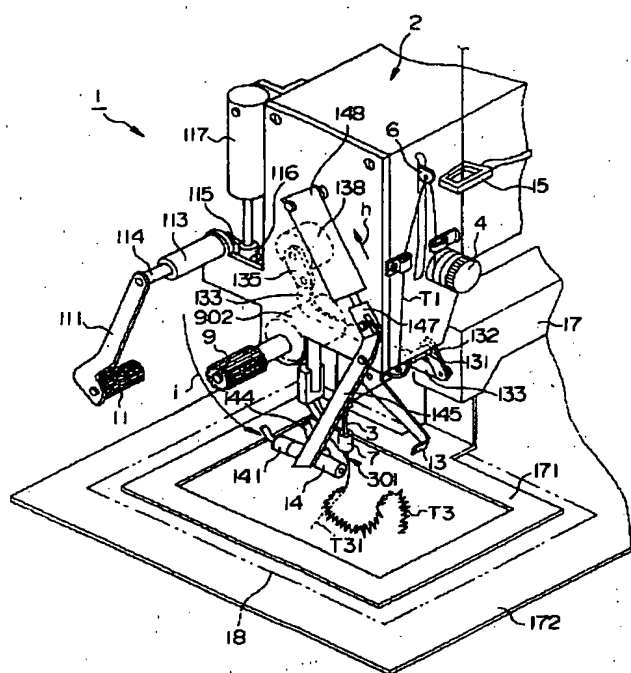
[Drawing 6]



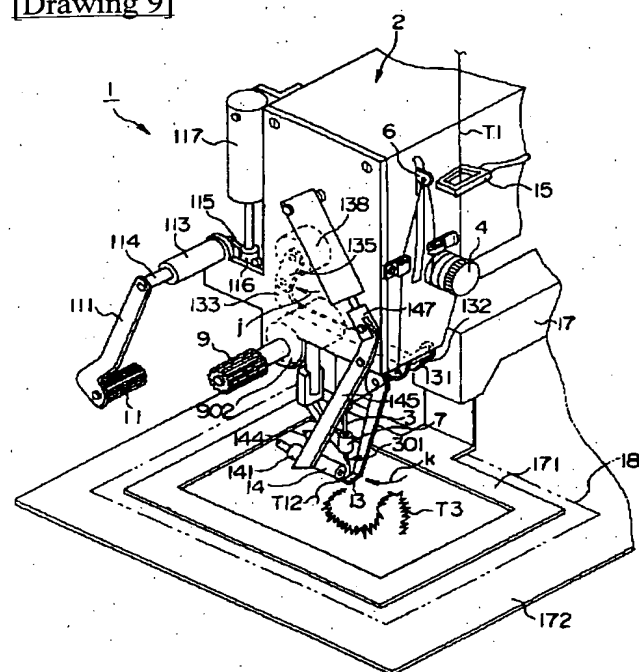
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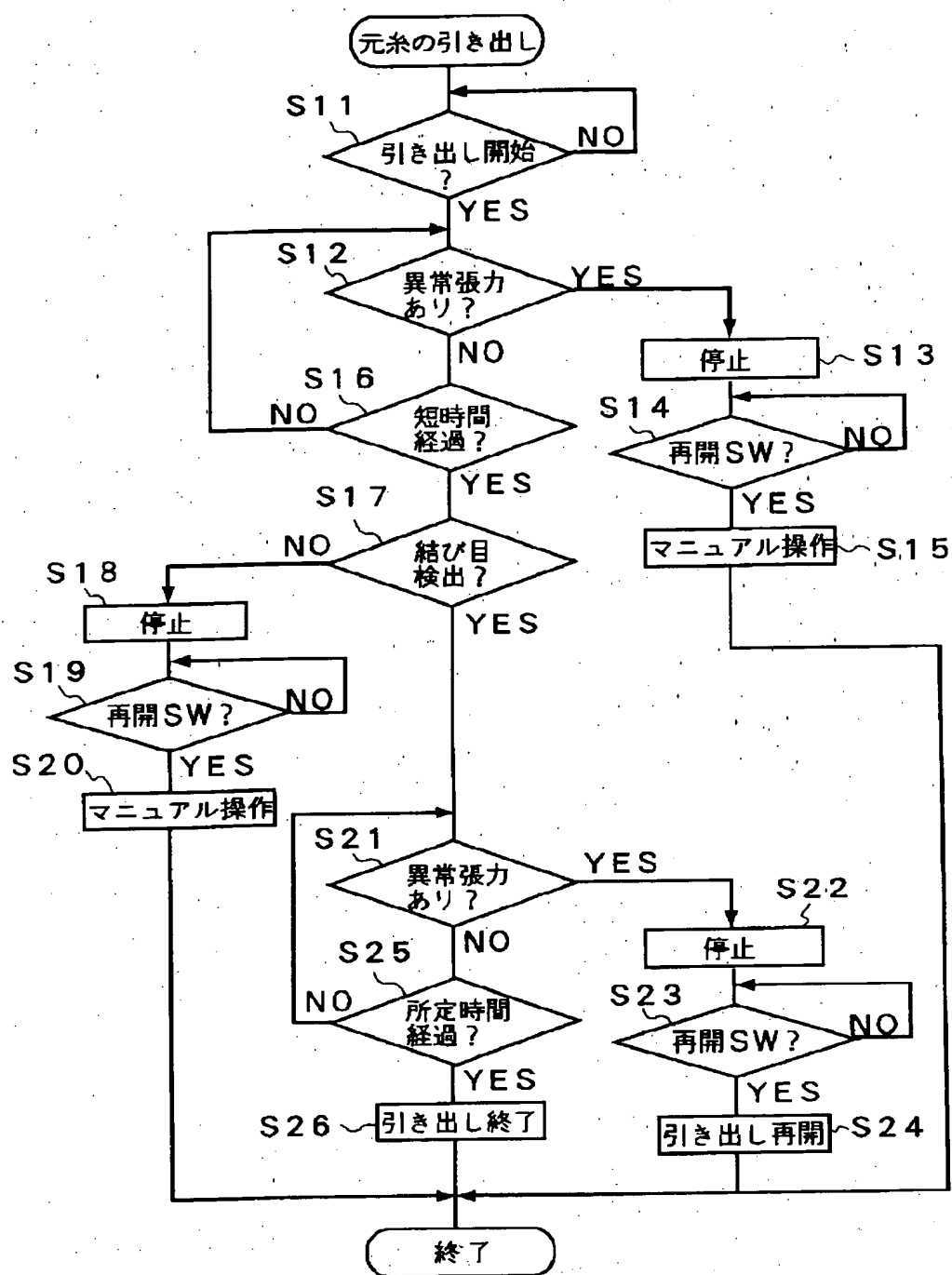
[Drawing 7]



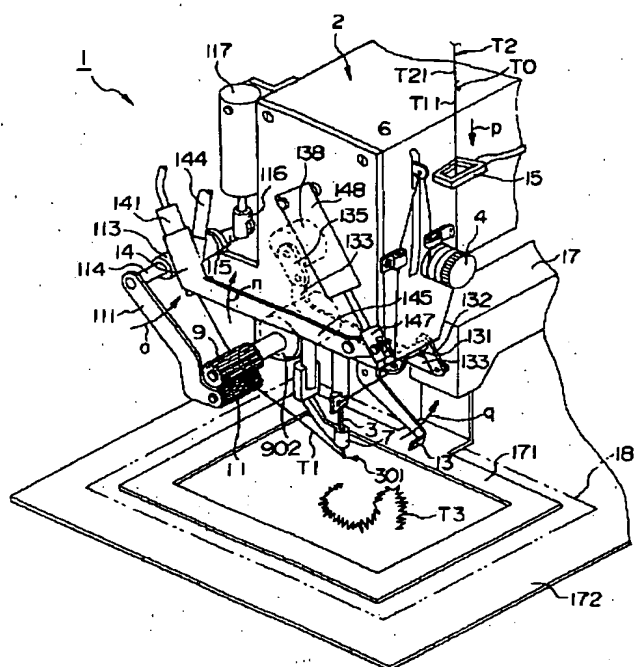
[Drawing 9]



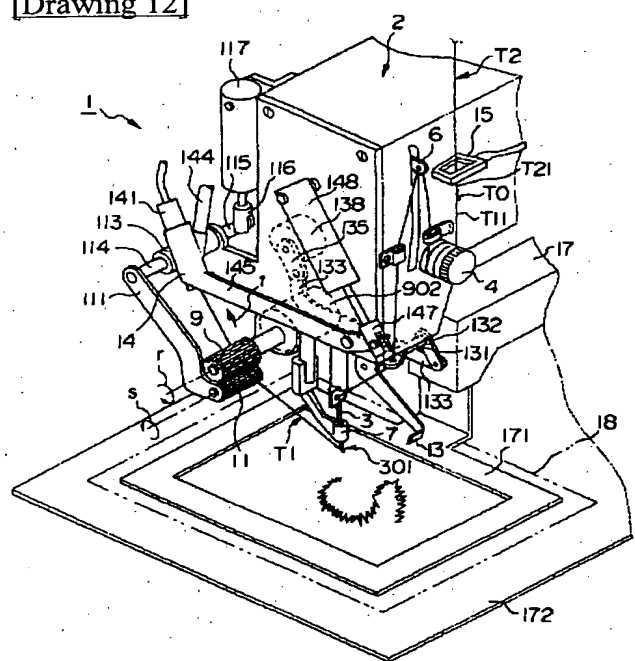
[Drawing 4]



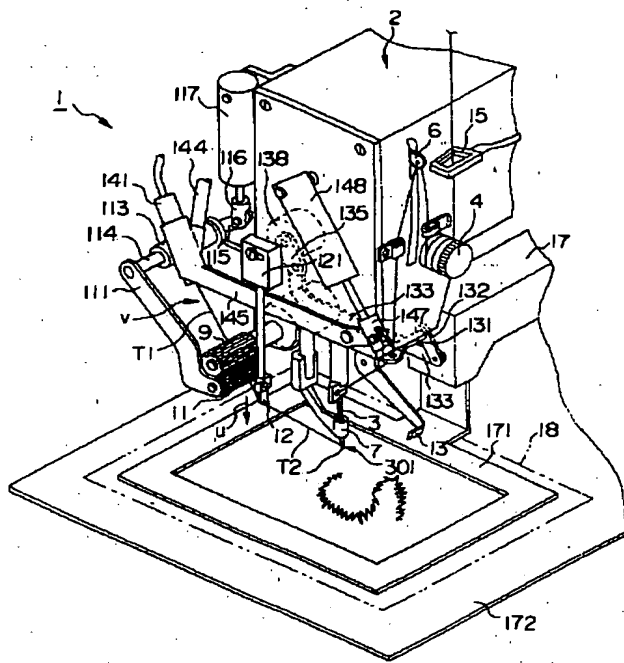
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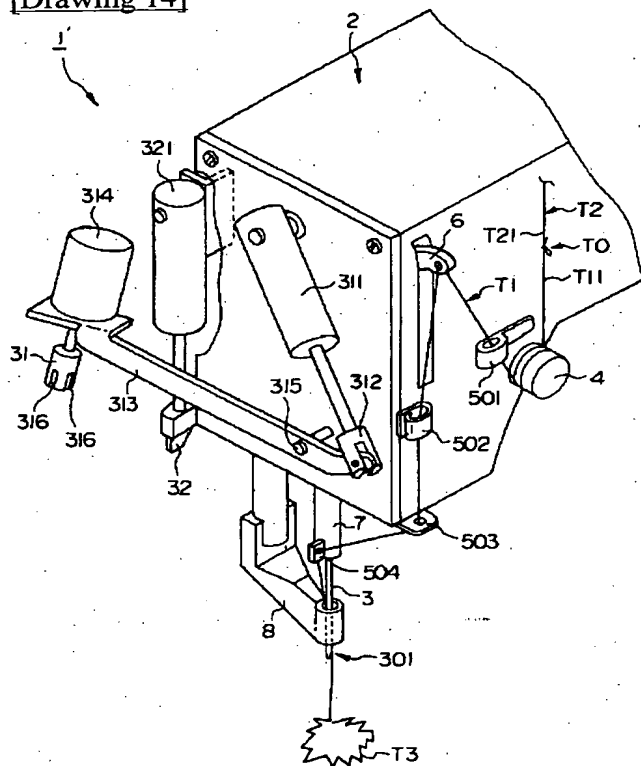
[Drawing 12]



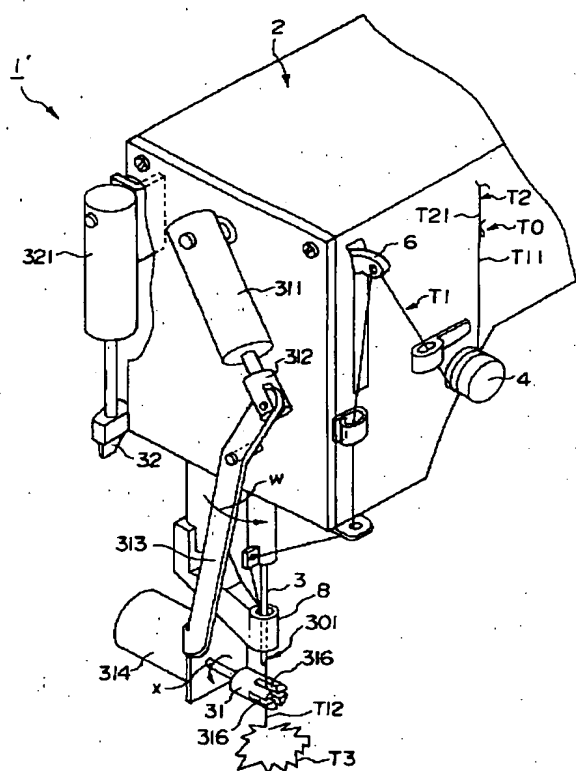
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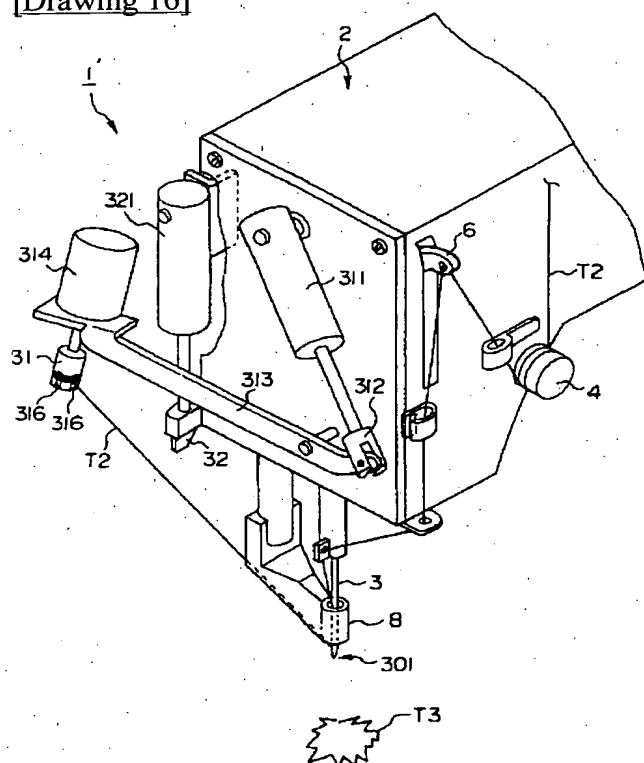
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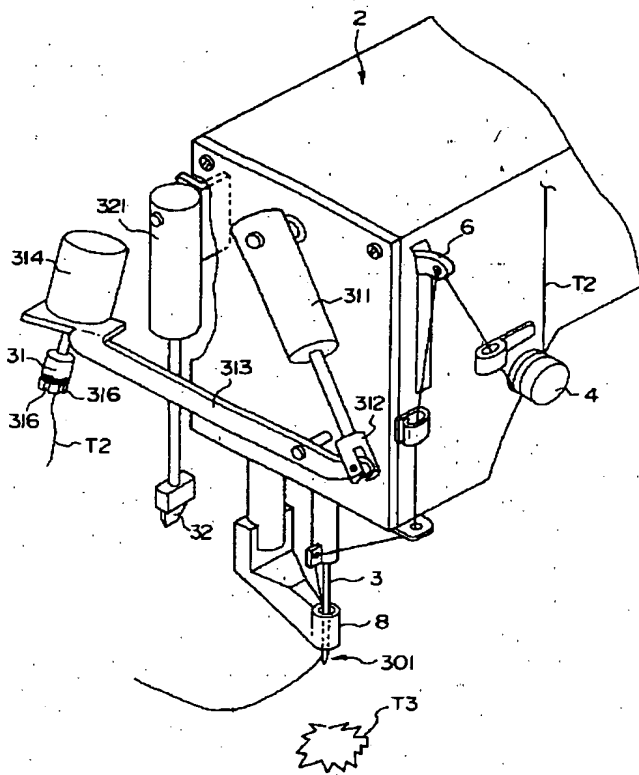
[Drawing 15]



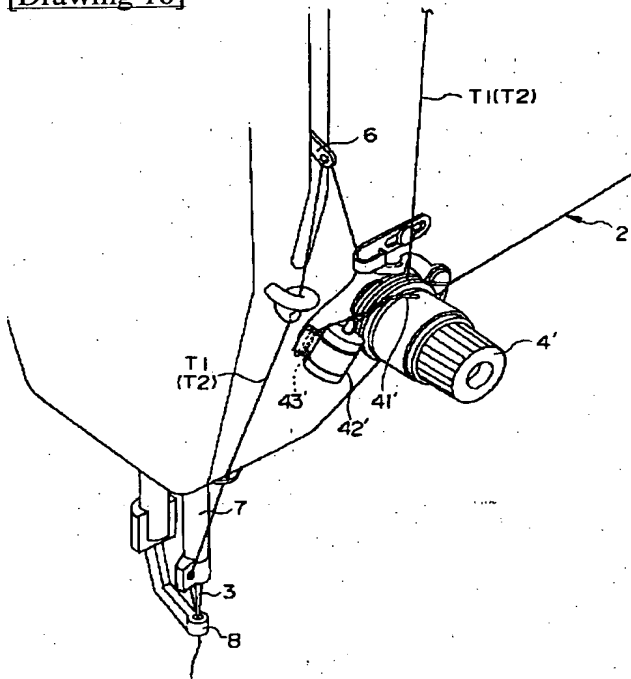
[Drawing 16]



[Drawing 17]



[Drawing 18]



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(71) 出願人 000003399

ジューキ株式会社

東京都調布市国領町8丁目2番地の1

(72) 発明者 矢野 延男

東京都調布市国領町8丁目2番地の1

ジューキ株式会社内

(72) 発明者 平松 徹

東京都調布市国領町8丁目2番地の1

ジューキ株式会社内

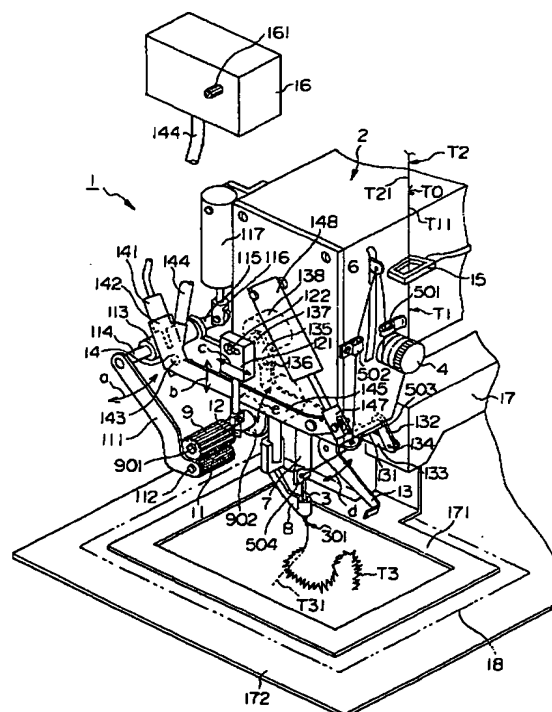
(74) 代理人 弁理士 荒船 博司 (外2名)

(54) 【発明の名称】 ミシンの交換糸引出し装置

(57) 【要約】

【課題】 元糸と交換糸との接続後に、元糸を針穴から引き出すことで交換糸を糸巻側から引出して針穴に通し、もって、上糸の交換を行うミシンの交換糸引出し装置において、元糸と交換糸との接続に失敗した場合でも、その後の復旧作業が容易で、もって縫製作業効率の高い、ミシンの交換糸引出し装置を提供する。

【解決手段】 駆動歯車9及び従動歯車11は、糸巻と針穴301との間の糸経路で切断された元糸T1の切断端部側T11と糸引出し端部側T21で接続されている交換糸T2を、元糸T1を針穴301から引き出すことで糸巻側から引出して針穴301に通す。結び目検出器15は、前記引出し作業中に両糸T1、T2の接続がなされなかったことを検出する。この接続がされなかったことが検出されたとき、CPU22は、駆動歯車9及び従動歯車11による元糸T1の引出し及びその後の縫製作業を中止する。



【特許請求の範囲】

【請求項1】糸巻と針穴との間の糸経路で切断された元糸の切断端部側と糸引出し端部側で接続されている交換糸を、前記元糸を前記針穴から引き出すことで糸巻側から引出して針穴に通す糸通し部と、
前記両糸の接続作業後、この接続がなされなかったことを検出する検出部と、
この接続がなされなかったことが検出されたときは、前記糸通し部による前記元糸の引出し及びその後の縫製作業を中止する制御部とを備えている、ミシンの交換糸引出し装置。

【請求項2】糸巻と針穴との間の糸経路で切断された元糸の切断端部側と糸引出し端部側で接続されている交換糸を、前記元糸を前記針穴から引き出すことで糸巻側から引出して針穴に通す糸通し部と、
前記両糸の接続後、この接続がされたことを検出する検出部とを備え、
前記糸通し部は、
前記接続が検出された後に、前記針穴から前記元糸の針穴通過済部分を牽引して、予め設定された所定糸長さを前記針穴から引出すことにより、前記交換糸を前記針穴に通すものである、ミシンの交換糸引出し装置。

【請求項3】糸巻と針穴との間の糸経路で切断された元糸の切断端部側と糸引出し端部側で接続されている交換糸を、前記元糸を前記針穴から引き出すことで糸巻側から引出して針穴に通す糸通し部と、
前記元糸の針穴通過済部分を捕捉する捕捉部とを備え、
前記糸通し部は、
前記両糸の接続後、前記捕捉状態にある前記捕捉部を駆動することで前記元糸を前記針穴から引出すものであり、
前記元糸引出し作業中に、前記捕捉部が前記元糸から受ける張力の変動を検出する検出部と、
この張力変動が所定の状態となったときは、前記糸通し部による前記元糸の引出し及びその後の縫製作業を中止する制御部とを備えている、ミシンの交換糸引出し装置。

【請求項4】糸巻と針穴との間の糸経路で切断された元糸の切断端部側と糸引出し端部側で接続されている交換糸を、前記元糸を前記針穴から引き出すことで糸巻側から引出して針穴に通す糸通し部と、
この糸通し後、前記針穴通過済の糸を前記針穴から所定長さを残して切断する糸切断部と、
この残される所定糸長さを調節する糸長さ調節部とを備えている、ミシンの交換糸引出し装置。

【請求項5】前記糸通し部は、
前記所定糸長さを調節する糸長さ調節部を備えている、請求項4に記載のミシンの交換糸引出し装置。

【請求項6】糸巻と針穴との間の糸経路で切断された元糸の切断端部側と糸引出し端部側で接続されている交換

糸を、前記元糸を前記針穴から引き出すことで糸巻側から引出して針穴に通す糸通し部と、
この糸通し後、前記針穴通過済の糸を前記針穴から所定長さを残して切断する糸切断部と、
この切断後の切り落とされた糸を吸引して回収する切落し糸回収部とを備えている、ミシンの交換糸引出し装置。

【請求項7】糸巻と針穴との間の糸経路で切断された元糸の切断端部側と糸引出し端部側で接続されている交換糸を、前記元糸を前記針穴から引き出すことで糸巻側から引出して針穴に通す糸通し部を備え、
この糸通し部は、
前記接続後の元糸の針穴通過済部分を捕捉部で捕捉して、この捕捉部を駆動して前記元糸を前記針穴から引き出すものであり、
前記元糸の針穴側端部を捕捉して前記捕捉部による元糸捕捉の位置決めを行う位置決め部とを備えている、ミシンの交換糸引出し装置。

【請求項8】糸巻と針穴との間の糸経路で切断された元糸の切断端部側と糸引出し端部側で接続されている交換糸を、前記元糸を前記針穴から引き出すことで糸巻側から引出して針穴に通す糸通し部と、
この糸通し後、前記針穴通過済の糸を前記針穴から所定長さを残して切断する糸切断部と、
前記元糸の針穴側端部を捕捉して前記針穴通過済の糸に流れ方向を一定として所定の張力を与え、前記切断作業のための位置決めをする位置決め部とを備えている、ミシンの交換糸引出し装置。

【発明の詳細な説明】**【0001】**

【発明の属する技術分野】この発明は、糸巻と針穴との間の糸経路で切断後の元糸の切断端部側と、交換糸の糸引出し端部側とを所定の上糸交換装置を用いて接続した後、この接続後の元糸を針穴から引き出して交換糸を糸巻側から引出して針穴に通し、もって、上糸の交換を行うためのミシンの交換糸引出し装置に関する。

【0002】

【従来の技術】糸巻と針穴との間の糸経路上糸を切断し、この切断後の元糸の切断端部側と交換糸の糸引出し端部側とを接続する上糸交換装置については、特公平3-5834号公報などに開示されている。

【0003】また、元糸と被交換糸との接続後に、元糸を針穴から引き出すことで交換糸を糸巻側から引出して針穴に通し、この引き出された元糸部分を切断して、上糸を交換する交換糸引出し装置については、特開平5-179560号公報などに開示されている。

【0004】

【発明が解決しようとする課題】しかし、上記従来の技術では以下のような問題があった。

【0005】すなわち、切断後の元糸の切断端部側と被

交換糸の糸引出し端部側との接続工程で両糸の接続に失敗した場合、それに引き続いて元糸を針穴から引き出すことで交換糸を糸巻側から引出して針穴に通そうとすると、元糸だけが針穴から引き出されてしまい、交換糸を糸巻側から引出して、糸調子、天秤などの設けられている所定の糸経路中を針穴まで糸通しする作業を手作業により行わねばならず、また、かかる作業を行う前に、その後の交換糸による縫製が開始されてしまうと、縫目が形成されぬまま針落ちがなされてしまい、元の位置まで針落ち位置を戻して交換糸の糸通しなどの煩雑な復旧作業を行わねばならず、縫製作業効率を低下させてしまう。

【0006】そこで、この発明の目的は、元糸と交換糸との接続後に、元糸を針穴から引き出すことで交換糸を糸巻側から引出して針穴に通し、もって、上糸の交換を行うミシンの交換糸引出し装置において、元糸と交換糸との接続に失敗した場合でも、その後の復旧作業が容易で、もって縫製作業効率の高い、ミシンの交換糸引出し装置を提供することにある。

【0007】また、別の課題として、元糸と交換糸との接続後、元糸を針穴から引き出して交換糸を針穴に通すにあたっては、糸の針穴からの引き出し量が少なくでは交換糸が針穴まで達せずに、糸交換後に交換糸での縫製が行えなくなる。逆に、引き出しすぎでは交換糸が針穴から過剰に引き出されて無駄に消費されてしまう。

【0008】そこで、この発明の別の目的は、元糸と交換糸との接続後に、元糸を針穴から引き出すことで交換糸を糸巻側から引出して針穴に通し、もって、上糸の交換を行うミシンの交換糸引出し装置において、交換糸への確実な交換と交換糸の無駄な消費を防止することができる、ミシンの交換糸引出し装置を提供することにある。

【0009】別の課題として、針穴までの糸経路で元糸と交換糸とを接続して、元糸を針穴から引き出して交換糸を針穴に通すにあたっては、前記両糸の結び目が糸経路中の何れかの位置で引っ掛かってしまったり、糸経路を通過する際の大きな摩擦となってしまう恐れがある。特に針穴においては、その危険性が高い。これを放置したのでは、交換糸が針穴まで達しなかったり、糸切れを生じる恐れがある。

【0010】そこで、この発明の別の目的は、元糸と交換糸との結び目が糸経路中で引っ掛かったり、大きな摩擦となって、交換糸が針穴まで達しなかったり、糸切れを生じるなどの事態を防止することができる、ミシンの交換糸引出し装置を提供することにある。

【0011】別の課題として、針穴まで交換糸を引出して元糸部分を切断するにあたり、針穴通過済みの針穴から先の交換糸長さを縫製目的などに応じて所望に調節したい場合がある。

【0012】そこで、この発明の別の目的は、元糸を針穴から引き出すことで交換糸を糸巻側から引出して針穴

に通し、引き出された元糸部分を切断する、ミシンの交換糸引出し装置において、針穴通過済みの針穴から先の交換糸長さを所望に調節できる、ミシンの交換糸引出し装置を提供することにある。

【0013】さらに、この発明の別の目的は、針穴通過済みの針穴から先の交換糸長さを所望に調節しても、元糸が針穴の先に残ってしまうことなどがない、ミシンの交換糸引出し装置を提供することにある。

【0014】この発明の別の目的は、元糸を針穴から引き出すことで交換糸を糸巻側から引出して針穴に通し、引き出された元糸部分を切断する、ミシンの交換糸引出し装置において、切断後の元糸のかたづけが容易である、ミシンの交換糸引出し装置を提供することにある。

【0015】この発明の別の目的は、元糸を針穴から引き出すことで交換糸を糸巻側から引出して針穴に通す、ミシンの交換糸引出し装置において、元糸を針穴から引き出すための元糸の捕捉を確実とする、ミシンの交換糸引出し装置を提供することにある。

【0016】この発明の別の目的は、元糸を針穴から引き出すことで交換糸を糸巻側から引出して針穴に通し、引き出された元糸部分を切断する、ミシンの交換糸引出し装置において、元糸部分の切断を確実とする、ミシンの交換糸引出し装置を提供することにある。

【0017】

【課題を解決するための手段】上記の課題を解決するための手段を、後述する発明の実施の形態における対応する部材や符号も付記して説明する。

【0018】請求項1に記載の発明は、糸巻と針穴(301)との間の糸経路で切断された元糸(T1)の切断端部側(T11)と糸引出し端部側(T21)で接続されている交換糸(T2)を、前記元糸を前記針穴から引き出すことで糸巻側から引出して針穴に通す糸通し部(駆動歯車9及び従動歯車11/ナックル31)と、前記両糸の接続作業後、この接続がなされなかったことを検出する検出部(結び目検出器15、CPU22)と、この接続がされなかったことが検出されたときは、前記糸通し部による前記元糸の引出し及びその後の縫製作業を中止する制御部(CPU22)とを備えている、ミシンの交換糸引出し装置である。

【0019】請求項1に記載のミシンの交換糸引出し装置によれば、元糸と交換糸とが接続されなかったことを検出し、元糸の針穴からの引出しや、その後の縫製作業を中止するから、元糸だけが針穴から引き出されてしまったり、針穴に上糸が糸通しされていない事態が防止される。

【0020】従って、請求項1に記載のミシンの交換糸引出し装置によれば、元糸と交換糸との接続に失敗した場合でも、その後の復旧作業が容易で、もって縫製作業効率の高い、ミシンの交換糸引出し装置を提供することができる。

【0021】請求項2に記載の発明は、糸巻と針穴(301)との間の糸経路で切断された元糸(T1)の切断端部側(T11)と糸引出し端部側(T21)で接続されている交換糸(T2)を、前記元糸を前記針穴から引き出すことで糸巻側から引出して針穴に通す糸通し部(駆動歯車9及び従動歯車11/ナックル31)と、前記両糸の接続後、この接続がされたことを検出する検出部(結び目検出器15、CPU22)とを備え、前記糸通し部は、前記接続が検出された後に、前記針穴から前記元糸の針穴通過済部分を牽引して、予め設定された所定糸長さを前記針穴から引出すことにより、前記交換糸を前記針穴に通すものである、ミシンの交換糸引出し装置である。

【0022】請求項2に記載のミシンの交換糸引出し装置によれば、元糸と交換糸との接続を検出し、この検出後、予め設定された所定糸長さを針穴から引出すことにより、交換糸を針穴に通すから、所定糸長さの調節により、元糸が確実に針穴から引き出され、且つ、針穴より引き出される交換糸の長さが過剰とならないようにすることができる。

【0023】従って、請求項2に記載のミシンの交換糸引出し装置によれば、交換糸への確実な交換と交換糸の無駄な消費を防止することができる、ミシンの交換糸引出し装置を提供することができる。

【0024】請求項3に記載の発明は、糸巻と針穴(301)との間の糸経路で切断された元糸(T1)の切断端部側(T11)と糸引出し端部側(T21)で接続されている交換糸(T2)を、前記針穴から前記元糸を引き出すことで糸巻側から引出して針穴に通す糸通し部(駆動歯車9及び従動歯車11/ナックル31)と、前記元糸の針穴通過済部分を捕捉する捕捉部(駆動歯車9及び従動歯車11/ナックル31)とを備え、前記糸通し部は、前記両糸の接続後、前記捕捉状態にある前記捕捉部を駆動することで前記元糸を前記針穴から引出すものであり、前記元糸引出し作業中に、前記捕捉部が前記元糸から受ける張力の変動を検出する検出部(回転センサ903、糸糸取りばね41、結び目検出器42、CPU22)と、この張力変動が所定の状態となったときは、前記糸通し部による前記元糸の引出し及びその後の縫製作業を中止する制御部(CPU22)とを備えている、ミシンの交換糸引出し装置である。

【0025】請求項3に記載のミシンの交換糸引出し装置によれば、元糸の針穴通過済部分を捕捉部で捕捉し、この捕捉部を駆動することで元糸を針穴から引出すものであり、捕捉部が元糸から受ける張力の変動が所定の状態となったときは針穴からの元糸の引出しを中止するので、元糸と交換糸との結び目が糸経路中で引っ掛かったり、大きな摩擦となったりした場合を異常な張力変動として検出して針穴からの元糸の引出しやその後の縫製作業を中止することができる。

【0026】従って、請求項3に記載のミシンの交換糸引出し装置によれば、元糸と交換糸との結び目が糸経路中で引っ掛かったり、大きな摩擦となって、交換糸が針穴まで達しなかったり、糸切れを生じるなどの事態を防止することができる、ミシンの交換糸引出し装置を提供することができる。

【0027】請求項4に記載の発明は、糸巻と針穴(301)との間の糸経路で切断された元糸(T1)の切断端部側(T11)と糸引出し端部側(T21)で接続されている交換糸(T2)を、前記針穴から前記元糸を引き出すことで糸巻側から引出して針穴に通す糸通し部(駆動歯車9及び従動歯車11)と、この糸通し後、前記針穴通過済の糸を前記針穴から所定長さを残して切断する糸切断部(メス12)と、この残される所定糸長さを調節する糸長さ調節部(ボリューム161、メス12、止めねじ122など)とを備えている、ミシンの交換糸引出し装置である。

【0028】請求項4に記載のミシンの交換糸引出し装置によれば、糸長さ調節部により、針穴通過済みの針穴から先の交換糸長さを所望に調節できる、ミシンの交換糸引出し装置を提供することができる。

【0029】この場合に、前記糸通し部による交換糸の引出し長さを調節する糸長さ調節部(ボリューム161)を設ければ(請求項5)、針穴から先の交換糸長さを所望に調節しても元糸が針穴の先に残ってしまったり、交換糸を過剰に無駄にしてしまうことなどが無い。

【0030】請求項6に記載の発明は、糸巻と針穴(301)との間の糸経路で切断された元糸(T1)の切断端部側(T11)と糸引出し端部側(T21)で接続されている交換糸(T2)を、前記針穴から前記元糸を引き出すことで糸巻側から引出して針穴に通す糸通し部(駆動歯車9及び従動歯車11)と、この糸通し後、前記針穴通過後の糸を前記針穴から所定長さを残して切断する糸切断部(メス12)と、この切断後の切り落とされた糸を吸引して回収する切れ糸回収部(バルブ144、真空発生器149)とを備えている、ミシンの交換糸引出し装置である。

【0031】請求項6に記載のミシンの交換糸引出し装置によれば、切断後の切り落とされた糸を吸引して回収するから、切断後の残り糸のかたづけが容易である、ミシンの交換糸引出し装置を提供することができる。

【0032】請求項7に記載の発明は、糸巻と針穴との間の糸経路で切断された元糸の切断端部側と糸引出し端部側で接続されている交換糸を、前記針穴から前記元糸を引き出すことで糸巻側から引出して針穴に通す糸通し部(駆動歯車9及び従動歯車11)を備え、この糸通し部は、前記接続後の元糸の針穴通過済部分を捕捉部(駆動歯車9及び従動歯車11)で捕捉して、この捕捉部を駆動して前記元糸を前記針穴から引き出すものであり、前記元糸の針穴側端部を捕捉して前記捕捉部による元糸

捕捉の位置決めを行う位置決め部(糸クランプ14)とを備えている、ミシンの交換糸引出し装置である。

【0033】請求項7に記載のミシンの交換糸引出し装置によれば、元糸の針穴側端部を捕捉して捕捉部による元糸捕捉のための位置決めを行うから、元糸を針穴から引き出すための元糸の捕捉を確実にする、ミシンの交換糸引出し装置を提供することができる。

【0034】請求項8に記載の発明は、糸巻と針穴(301)との間の糸経路で切断された元糸(T1)の切断端部側(T11)と糸引出し端部側(T21)で接続されている交換糸(T2)を、前記針穴から前記元糸引き出すことで糸巻側から引出して針穴に通す糸通し部(駆動歯車9及び従動歯車11)と、この糸通し後、前記針穴通過済の糸を前記針穴から所定長さを残して切断する糸切断部(メス12)と、前記元糸の針穴側端部(T12)を捕捉して前記針穴通過済の糸に流れ方向を一定として所定の張力を与え、前記切断作業のための位置決めをする位置決め部(糸クランプ14)とを備えている、ミシンの交換糸引出し装置である。

【0035】請求項8に記載のミシンの交換糸引出し装置によれば、元糸の針穴側端部を捕捉して針穴通過済の糸に流れ方向を一定として所定の張力を与え、元糸側の切断作業のための位置決めをすることができるから、元糸部分の切断を確実にする、ミシンの交換糸引出し装置を提供することができる。

【0036】

【発明の実施の形態】

〔発明の実施の形態1〕まず、構成について説明する。

【0037】図1は、この発明の実施の形態1である交換糸引出し装置1の斜視図である。

【0038】符号2は自動縫いマシンであり、このミシンの頭部に交換糸引出し装置1が設けられている。

【0039】詳細な説明は省略するが、自動縫いマシン2には所定の上糸交換装置(図示省略)が設けられ、この上糸交換装置は糸巻(図示省略)と針3の針穴301との間の糸経路で上糸を切断し、この切断後の元糸T1の切断端部側T11と交換糸T2の糸引出し端部側T21とを接続する。上糸交換装置2としては例えば特公平3-5834号公報などに開示されているものを用いることができる。符号T0は両糸T1、T2の結び目である。

【0040】元糸T1は所定の糸経路を通過して針穴301に通されている。この糸経路には、糸調子4、糸案内501、502、503及び504並びに天秤6が設けられている。符号7は針棒であり、符号8は針落ちと連動して所定の駆動機構により上下往復動する中押えである。

【0041】駆動歯車9は軸901に固定され、駆動モータ902により回転する。駆動モータ902には、このモータの回転軸の回転角を検出する回転センサ903

(図1において図示省略)が設けられている。従動歯車11は駆動腕111の一端側に軸112により回転自在に取り付けられている。駆動腕111の他端側には軸受113に回転自在に軸支されている軸114の一端側が取り付けられている。軸114の他端側にはレバー115の一端側が取り付けられ、他端側はナックル116を介してエアシリンダ117のシリンダロッドと連結されている。駆動腕111は、シリンダ117の駆動により矢示a方向に回転して、従動歯車11を、駆動歯車9と噛み合わせたり、駆動歯車9側から退避させたりする。

【0042】糸切りメス12はエアシリンダ121のシリンダロッドに取り付けられて、このエアシリンダの駆動により矢示b方向に昇降する。また、止めねじ122のねじ止め位置を調節することにより、メス12の先端部位置を矢示c方向に調節することができる。

【0043】符号13は上糸をワイプするワイパである。このワイパの基端側は回転自在にミシンフレームに軸支されている軸131の一端側に取付けられ、他端側にはレバー132の一端側が固定されている。レバー132の他端側にはワイパー腕133の一端側が軸134で回転自在に取り付けられ、ワイパー腕133の他端側には駆動レバー135の一端側に軸136で回転自在に取り付けられている。駆動レバー135は軸137でワイパソレノイド138と連結されている。ワイパソレノイド138の駆動によりワイパ13は矢示d方向に移動する。

【0044】符号14は糸クランプであり、この糸クランプ内にはエアシリンダ141で駆動されるクランプ部142とボール143が設けられ、糸端をクランプ部142とボール143でクランプする。また、糸クランプ14にはバルブ144が接続され、このバルブ144からのエアの吸引により糸端を吸引する。糸クランプ14は駆動腕145の一端側に取り付けられている。駆動腕145の中間位置は軸146でミシンフレームに回転自在に取り付けられている。駆動腕145の他端側はナックル147を介してエアシリンダ148のシリンダロッドと連結されている。エアシリンダ148の駆動により、駆動腕145は矢示e方向に回転する。

【0045】符号15は上糸の糸経路の糸調子4より糸引出し側に設けられている糸結び目検出器(光センサ)であり、結び目T0を検出する。符号16は電装ボックスであり、電装ボックス16にはモータ902への通電時間をマニュアル操作で調節するためのタイマ調節ボリューム161が設けられている。

【0046】符号17はミシンベッド上に設けられている送り台である。この送り台には押え171が設けられていて、この押えは被縫物18を保持する。送り台17は所定の可動テーブル上をX-Y方向に移動し針板172上で被縫物18をX-Y方向に送る。この送り動作は所定の縫いデータに含まれているX-Y座標データに従

って行われ、このように送られる被縫物18上に針落ちすることで、所定の形状縫いが行われる。これらは周知技術であるため、これ以上の詳細な説明は省略する。

【0047】次に、交換糸引出し装置1の制御系の構成について説明する。

【0048】図2は、交換糸引出し装置1の制御系の構成を示すブロック図である。

【0049】同図に示すように、電装ボックス16内にはミシン制御装置19を備えている。このミシン制御装置は、所定のフロッピーディスクドライブを備え、フロッピーディスク21に格納されている所定の縫いデータに基づき所定の形状縫いを施すためにミシン2の各部を制御する。すなわち、フロッピーディスク21に格納されている所定の縫いデータに基づき、送り台17、ミシンモータによるミシン2の上下軸(図示省略)などの駆動を制御して、送り台17をX-Y方向に駆動しつつ針落ちすることで、所望の形状縫いを施すものである。ミシン制御装置19は糸引出開始信号を糸引出制御部22に出力する。

【0050】糸引出制御部(CPU)22にはROM23、RAM24が接続されている。ROM23には上糸交換のため各部の制御を行うための所定の制御プログラムなどが格納されている。

【0051】糸引出制御部22はミシン停止信号や糸引出終了信号をミシン制御装置19に出力する。また、糸引出制御部22は電磁弁SV1~SV5に制御信号を送って制御する。この電磁弁SV1~SV4は、各々、前記エアシリンダ117、148、141及び121へのエアの供給を操作するものである。また、電磁弁SV5は、前記糸クランプ14内のエアを吸引する真空発生器149とを接続している前記バルブ144に設けられて、バルブ144を開閉するものである。真空発生器149は前記電装ボックス16内に設けられている。糸引出制御部22は前記ソレノイド138を駆動するソレノイドドライバ139に制御信号を送ってソレノイド138を制御する。また、糸引出制御部22は前記駆動モータ902を駆動するモータドライバ904に制御信号を送ってモータ902を制御する。さらに、糸引出制御部22には前記糸結び検出器15や、モータ902に設けられている前記回転センサ903からの検出信号が入力される。

【0052】次に、作用について説明する。

【0053】以下では、図3、図4のフローチャートと、図5~図7、図9、図13及び図14はの斜視図、図8及び図10の断面図を参照して説明する。

【0054】図5は被縫物18を送り172でX-Y方向に送りつつ針落ちして縫目T3を形成し、所定の糸切りを行った状態を示している。縫目T3の形成に使用した上糸は元糸T2と同一の糸巻から引き出された同一の糸である。糸切り後の縫目T3の糸端T31は針板17

2の下側で切断された状態となっている。このとき、駆動歯車9と従動歯車11とは噛み合った状態にある。図5には示されていないが、この段階で、針穴301と糸巻(図示省略)との間の糸経路の糸調子4より糸巻側の所定位置で元糸T1は切断され、その切断端部側T11と、他の交換糸T2の糸引出し端部側T21とは(図1参照)、前記の上糸交換装置で糸結びされている。

【0055】ミシン制御装置19は、前記上糸交換装置で前記糸結びの動作がなされると、CPU22に糸引出開始信号を出力する。

【0056】図3に示すように、CPU22が糸引出開始信号を受けると(ステップS1)、電磁弁SV1に制御信号を出力して、シリンダ117を駆動し、図6に示すように、そのシリンダロッドを矢示f方向に移動して、従動歯車11の駆動歯車9との噛み合いを解放して矢示g方向に退避する(ステップS2)。

【0057】次に、電磁弁SV2に制御信号を送信して、図7に示すように、シリンダ148のシリンダロッドを矢示h方向に移動し、駆動腕145を矢示i方向に回転して、糸クランプ14を針穴301の近傍に移動する(ステップS3)。このときの糸クランプ14内部では、図8に示すようにクランプ部142はシリンダ141側に退避した状態にあり、ボール143は糸クランプ141内でフリーである。

【0058】この後、ソレノイドドライバ139に制御信号を送り、図9に示すように、ソレノイド138で駆動レバー135を矢示j方向に回転し、ワイバ13を矢示k方向に回転して、針穴301の先の元糸T12を糸クランプ14側にたぐりよせる(ステップS4)。この状態で、電磁弁SV5に制御信号を出力し、図10に示すように、バルブ144から矢示l方向にエアを吸引して、糸端T12を糸クランプ14内に吸引し、続いて、電磁弁SV3に制御信号を出力してシリンダ141を駆動し、クランプ部142の先端を矢示m方向に移動してボール143を押圧し、ボール143と糸クランプ14の内壁との間に糸端T12をクランプし、電磁弁SV3に制御信号を出力して前記エアの吸引は停止する(ステップS5)。

【0059】次に、電磁弁SV2に制御信号を送り、図11に示すように、シリンダ148を駆動して駆動腕145を矢示n方向に回動し、糸クランプ14により元糸T1を矢示p方向に牽引する。そして、電磁弁SV1に制御信号を出力してシリンダ117を駆動し、駆動腕111を矢示o方向に回動して、駆動歯車9と従動歯車11とを再び噛み合わせて元糸T1を挟持する。また、ソレノイドドライバ139に制御信号を出力してソレノイド138を駆動し、ワイバ13を矢示q方向に回転して元の位置に戻す(ステップS6)。

【0060】そして、電磁弁SV3に制御信号を出力して、クランプ部142をシリンダ141側に戻してボー

ル143をフリーにし、また、電磁弁SV5に制御信号を出力して、バルブ144からのエアの吸引をおこなう(ステップS7)。ボール143をフリーにしてもエアの吸引があるので、元糸端部T12は糸クランプ14から抜け落ちない。

【0061】このまま、モータドライバ904に制御信号を出力して駆動モータ902を駆動し、図12に示すように、駆動歯車9を矢示r方向に回転し、これに伴って従動歯車11が矢示s方向に回転する。この歯車対偶により元糸T1が針穴301から引き出される(ステップS8)。引き出される元糸T1はバルブ144内に吸引されていく。

【0062】モータ902駆動開始後、所定時間経過すると、モータ902を停止する(ステップS8〔後述する〕)。その後、電磁弁SV4に制御信号を出力し、図13に示すように、シリンダ121を駆動してメス12を矢示u方向に下降して、引き出した上糸を切断し、糸切りを行う(ステップS9)。なお、モータ902を駆動する前記の所定時間(後述)は、この糸切りのときに切断後に針穴301から引き出されている上糸に元糸T1は残っておらず、かつ、切断後の残り糸中の交換糸T2の長さが無駄に長くならない程度に前記糸の引出しが行える程度とする(のが望ましい)。切断後の残り糸はバルブ144に吸引されて排出され、また、シリンダ121の駆動によりメス12は元の位置に戻す。なお、止めねじ122の締付け位置を調節することで、メス12の位置を調節して、糸切り後の針穴301から先の交換糸T2の長さを調節することができる。

【0063】この糸切り後、CPU22は糸引出終了信号をミシン制御装置19に出力して(ステップS10)、交換糸の引き出し作業は終了し、糸引出終了信号を受けたミシン制御装置19の制御によりミシン2は交換糸T2による所定の縫製を再開する。

【0064】前記元糸の引き出し工程(ステップS8)について説明する。

【0065】この工程では前記のとおり、モータ902を前記所定時間経過するまで駆動して、所定長さの上糸を針穴301から引き出す。そして、モータ902を駆動する所定時間内に結び目T0の検出、元糸T2の以上張力の検出が行われ、これらに基づいて所定の操作が行われる。

【0066】図4に示すように、元糸T1の引出しが開始されると(ステップS11)、回転センサ903の検出信号から駆動歯車9が元糸T1から受ける張力の変動が所定の状態となったとき、例えば予め設定されている張力値を越えた場合は、モータ902を停止する(ステップS12、ステップS13)。この場合、操作者は所定の点検、処置を施した後、所定の運転再開スイッチを操作してモータ902の駆動を再開し(ステップS14)、モータ902の駆動時間をマニュアル操作して所

望の長さの上糸を引き出して(ステップS15)、終了する。

【0067】ステップS12で異常張力を検出しないときは、前記元糸T1の引き出し開始(ステップS11)後、予め設定されている所定の短時間が経過したか否かを判断し(ステップS16)、経過していないときはステップS12に戻り、経過しているときはステップS17に進む。

【0068】ステップS17では前記の短時間内で、元糸T1が引き出されて元糸T1と交換糸T2との結び目T0が糸結び目検出器15により検出されたか否か、すなわち、前記上糸交換装置で元糸T1と交換糸T2が接続されたか否かを判断する。結び目T0が形成されていなかったときは、直ちにモータ902を停止する(ステップS18)。前記の短時間やモータ902停止のタイミングは元糸T1の端部T11が糸調子4を通過する直前で元糸T1の引出しが停止するようにする(のが望ましい)。これにより、糸調子4の手前で停止している糸端部T11と交換糸端部T21とを手作業により接続し、所定の再開スイッチを操作してモータ902の駆動を再開し(ステップS19)、モータ902の駆動時間をマニュアル操作して所望の長さの上糸を引き出して(ステップS20)、終了する。

【0069】ステップS17で結び目T0が検出されたときは、ステップS21に進む。ステップS21では、前記ステップS12同様、回転センサ903の検出信号から駆動歯車9が元糸T1から受ける張力の変動が所定の状態となったときは、モータ902を停止する(ステップS21、ステップS22)。前記同様、操作者は所定の点検、処置を施した後、所定の運転再開スイッチを操作し(ステップS23)、モータ902の駆動時間をマニュアル操作して所望の長さの上糸を引き出して(ステップS24)、終了する。

【0070】ステップS21で元糸T1の異常張力が検出されなかったときは、モータ902の駆動を維持し、モータ902駆動開始後(ステップS11)から予め設定された所定時間(ステップS9の説明で前記)が経過したときは(ステップS25)、モータ902を停止して元糸T1の引出しを停止する(ステップS26)。

【0071】また、前記の予め設定された所定時間(ステップS25)は、ボリューム161(図1参照)でマニュアル調節できる。

【0072】なお、糸結び目検出器(光センサ)15は、通常糸1本分の幅を結び目T0と誤検出しないように、予め受光ボリューム、オペレーショナルアンプリファ(何れも図示せず)を調整しておく。

【0073】以上説明した、交換糸引出し装置1によれば、元糸T1と交換糸T2とが接続されなかったことを検出器15で検出し、元糸T1の針穴301からの引出しを停止するから、元糸T1だけが針穴から引き出され

てしまい、針穴301まで所定の糸経路に手作業で交換糸T2を糸通しする事態が防止される(上記の例では交換糸端部T21が糸調子4の手前にあるため、手作業による両糸T1、T2の接続も容易である)。また、所定の再開スイッチを操作しない限り、その後の縫製作業も行われないから、交換糸T2がないまま縫製がなされる事態も防止される。従って、元糸T1と交換糸T2との接続に失敗した場合でも、その後の復旧作業が容易で、もって縫製作業効率の高い、交換糸引出し装置を提供することができる。

【0074】また、モータ902の駆動を予め設定されている所定時間内として上糸の引出しを所定長さとするから(ステップS25、ステップS26)、モータ902の駆動停止時の結び目T0を適切な位置(メス12降下位置を少し越えた位置など)となるように調節すれば、糸切り(ステップS9)後の上糸に元糸T1が残らず、また、交換糸T2を過剰に無駄にしてしまうこともない。

【0075】さらに、元糸T1を針穴301から引き出すときに、元糸T1からの異常な張力変動を検出したときは、モータ902の駆動を停止するから(ステップS12、ステップS13、ステップS21、ステップS22)、元糸T1と交換糸T2との結び目T0が糸経路中で引っ掛かったり、大きな摩擦となったりした場合を異常な張力変動として検出して針穴からの元糸の引出しを中止することができる。従って、これらの事由により交換糸T2が針穴301まで達しなかったり、糸切れを生じるなどの事態を防止することができる。また、再開スイッチ(図示せず)を操作しない限り、その後の縫製作業も行われないようにすれば、上糸なしで針落ちすることもない。

【0076】メス12による糸切り位置は止めねじ122で調節でき、また、前記の予め設定された所定時間(ステップS25)は、ボリューム161(図1参照)でマニュアル調節できるから、これらの調節により、針穴301通過済みの針穴301から先の交換糸T2の長さを所望に調節できる。また、これらの調節により、糸切り後に、針穴301から先の交換糸T2に元糸T1が残ったり、交換糸T2を過剰に無駄にしたりすることがない。

【0077】糸切り後の残り糸はバルブ144に吸引されて回収されるから、残り糸のかたづけが容易である。

【0078】駆動歯車9、従動歯車11による元糸T1の挟持は、糸クランプ14で元糸端部T12をクランプし位置決めして行うから、元糸T1を針穴301から引き出すための元糸T1の捕捉を確実にすることができる。

【0079】メス12による上糸切りは、糸クランプ14で元糸端部T12をクランプし駆動腕145を一定量退避させることで、針穴301通過済の上糸の流れ方向

を一定として所定の張力を与え、切断作業のための位置決めをすることができるから、降下するメス12による元糸T1部分を含む上糸の切断を確実にすることができる。

【0080】なお、上記交換糸引出し装置1は、言うまでもなく、この発明を限定するものではない。例えば、図13における駆動歯車9及び従動歯車11と、駆動糸クランプ14との間の糸経路の中間位置(矢示v)にも糸結び目検出器(光センサ)を設けて、当該位置で結び目T0を検出してからシリンダ121を駆動してメス12による糸切りを行うようにしてもよい。

【0081】また、上記の例では接続された元糸T1と交換糸T2とを糸引出し作業中に、その接続の有無を検出する手段として、結び目検出器15を用いている。

【0082】これに代えて図18に示すように、周知の糸調子4'と、この糸調子4'に掛け渡された糸に係合するとともに、糸の引き出し作業に伴い揺動する糸取りばね41'と、所定の糸結び目検出器(マイクロスイッチなど)42'を用いて元糸T1と交換糸T2との接続の有無を検出するようにしてもよい。なお、符号43'は糸に係合する糸係合部材である。

【0083】この場合に、糸取りばね41'が糸から受ける力は必ずしも一定ではないので、糸結び目がなされていても一時的に糸結び目検出器42'による糸結び目の検出がなされないことも考えられる。

【0084】そこで、糸結び目位置から結び目T0が糸調子4'の直前まで達するのにモータ902が例えば8回転するとすれば、回転センサ903でモータ902の回転を検知し、1回転する毎のスイッチのON(糸結び目あり)、OFF(糸結び目なし)を所定のカウンタでカウントして、例えば、8回中5回以上はOFFなら糸結び目がなされている、4回以下なら糸結び目がなされていないと判断するようにすればよい。

【0085】〔発明の実施の形態2〕図14は、この発明の実施の形態2である交換糸引出し装置1'の斜視図である。

【0086】符号2は自動縫いミシンであり、このミシンの頭部に交換糸引出し装置1'が設けられている。図1～図13と同一符号の部材は、前記交換糸引出し装置1と同様の部材であり、詳細な説明は省略する。

【0087】まず、構成について説明する。

【0088】交換糸引出し装置1'が交換糸引出し装置1と相違する点は、まず、ミシン2の頭部にエアシリンダ311を設け、このエアシリンダのシリンダロッドにナックル312を介して駆動腕313の一端部を取付け、他端部にはモータ314を固定している。さらに、支点軸315を介して駆動腕313は長手方向の中間位置でミシン頭部に対し回動自在に取り付けられている。モータ55のモータ軸には、先端部に溝316、316の形成されているナックル31が設けられている。

【0089】このナックル31は発明の実施の形態1における駆動歯車9、従動歯車11に代えるもので、糸クランプ14、ワイパ13及び既に説明したこれらの駆動機構も設けられていない。符号32は上糸切りを行うメスであり、符号321は、このメスを駆動するエアシリンダである。

【0090】次に、作用について説明する。

【0091】まず、ミシン2が糸切り動作に入る1〜数針前の状態で前記上糸の交換装置により元糸T1と交換糸T2とが糸結びされ、これによりミシン2は糸切り動作に入り、元糸T1を縫目T3より切断する。

【0092】このときの状態が図14である。次に、図15に示すように、シリンダ311の駆動により駆動腕313を矢示w方向に回転する。これにより、ナックル31は針3の針先に移動して、その溝316に元糸の端部T12に係合する。そして、モータ314でナックル31を矢示x方向に回転すると、上糸がナックル31の周部分に巻取られ、図16に示すように、駆動腕313を回転してナックル31を元の位置に戻すことにより、元糸T1を針穴301から引き出すことができる。この後、上糸を前記発明の実施の形態1と同様に、メス12で切断することにより交換糸T2の引き出し作業を行うことができる。

【0093】以上説明した、交換糸引出し装置1によれば、交換糸引出し装置1のように、糸クランプ14により元糸端部T12をクランプして元糸T1の引出しや糸切りの位置決めをしたり、ワイパ13で糸クランプ14による糸クランプを容易にしたりする必要がなく、元糸T1の引出しや糸切りの位置決めはナックル31を動作することで行うことができるから、交換糸引出し装置1より、少ない部品点数で、製造コストの低い、交換糸引出し装置を提供することができる。

【0094】また、交換糸引出し装置1と同様に、検出器15で結び目を検出し、元糸T1と交換糸T2との接続ができなくても、その後の復旧作業を容易として、もって縫製作業効率を高めるようにしてもよい。

【0095】モータ314の駆動を予め設定されている所定時間内とすれば、交換糸引出し装置1と同様に、上糸の引出しを所定長さとして、モータ314の駆動停止時の結び目T0を適切な位置（メス12降下位置を少し越えた位置など）となるように調節すれば、糸切り後の上糸に元糸T1が残らず、また、交換糸T2を過剰に無駄にになってしまうこともない。

【0096】前記回転センサ903でモータ314の回転を検出するようにすれば、元糸T1からの異常な張力変動を検出したときに、モータ314の駆動を停止し、元糸T1と交換糸T2との結び目T0が糸経路中で引っ掛かったり、大きな摩擦となったりした場合を異常な張力変動として検出して針穴からの元糸の引出しを中止することができ、交換糸T2が針穴301まで達しなかつ

たり、糸切れを生じるなどの事態を防止することもできる。また、この場合に、再開スイッチを操作しない限りモータ314の駆動の再開もないようにすれば、その後の縫製作業も行われず、上糸なしで針落ちがされることもない。

【0097】メス32を前記メス12同様、昇降位置を変更可能に構成し、モータ314の駆動時間をボリューム161（図1参照）でマニュアル調節できるようにすれば、針穴301通過済みの針穴301から先の交換糸T2の長さを所望に調節できる。また、これらの調節により、糸切り後に、針穴301から先の交換糸T2に元糸T1が残ったり、交換糸T2を過剰に無駄にしたりすることがない。

【0098】糸切り後、ナックル31には残り糸が巻き付けられたままになっているが、次の糸交換時に手作業により除去してもよいし、何度かの糸交換後にまとめて除去するようにしてもよい。

【0099】

【発明の効果】請求項1に記載の発明によれば、元糸と交換糸との接続に失敗した場合でも、その後の復旧作業が容易で、もって縫製作業効率の高い、ミシンの交換糸引出し装置を提供することができる。

【0100】請求項2に記載の発明によれば、交換糸への確実な交換と交換糸の無駄な消費を防止することができる、ミシンの交換糸引出し装置を提供することができる。

【0101】請求項3に記載の発明によれば、元糸と交換糸との結び目が糸経路中で引っ掛かったり、大きな摩擦となって、交換糸が針穴まで達しなかつたり、糸切れを生じるなどの事態を防止することができる、ミシンの交換糸引出し装置を提供することができる。

【0102】請求項4に記載の発明によれば、糸長さ調節部により、針穴通過済みの針穴から先の交換糸長さを所望に調節できる、ミシンの交換糸引出し装置を提供することができる。

【0103】請求項5に記載の発明によれば、請求項4に記載の発明と同様の効果を奏するほか、針穴通過済みの針穴から先の交換糸長さを所望に調節しても、交換糸への確実な交換と交換糸の無駄な消費を防止することができる、ミシンの交換糸引出し装置を提供することができる。

【0104】請求項6に記載の発明によれば、切断後の残り糸のかたづけが容易である、ミシンの交換糸引出し装置を提供することができる。

【0105】請求項7に記載の発明によれば、元糸を針穴から引き出すための元糸の捕捉を確実にする、ミシンの交換糸引出し装置を提供することができる。

【0106】請求項8に記載の発明によれば、元糸部分の切断を確実にする、ミシンの交換糸引出し装置を提供することができる。

【図面の簡単な説明】

【図1】この発明の実施の形態1である交換糸引き出し装置の斜視図。

【図2】この発明の実施の形態1である交換糸引き出し装置の制御系の構成を示すブロック図。

【図3】この発明の実施の形態1である交換糸引き出し装置の作用を説明するフローチャート。

【図4】この発明の実施の形態1である交換糸引き出し装置の作用を説明するフローチャート。

【図5】この発明の実施の形態1である交換糸引き出し装置の作用を説明する斜視図。

【図6】この発明の実施の形態1である交換糸引き出し装置の作用を説明する斜視図。

【図7】この発明の実施の形態1である交換糸引き出し装置の作用を説明する斜視図。

【図8】この発明の実施の形態1である交換糸引き出し装置の糸クランプの断面図。

【図9】この発明の実施の形態1である交換糸引き出し装置の作用を説明する斜視図。

【図10】この発明の実施の形態1である交換糸引き出し装置の糸クランプの断面図。

【図11】この発明の実施の形態1である交換糸引き出し装置の作用を説明する斜視図。

【図12】この発明の実施の形態1である交換糸引き出し装置の作用を説明する斜視図。

【図13】この発明の実施の形態1である交換糸引き出し装置の作用を説明する斜視図。

【図14】この発明の実施の形態2である交換糸引き出し装置の斜視図。

【図15】この発明の実施の形態2である交換糸引き出し装置の作用を説明する斜視図。

し装置の作用を説明する斜視図。

【図16】この発明の実施の形態2である交換糸引き出し装置の作用を説明する斜視図。

【図17】この発明の実施の形態2である交換糸引き出し装置の作用を説明する斜視図。

【図18】この発明の実施の形態1である交換糸引き出し装置の変形例を説明する斜視図。

【符号の説明】

1 交換糸引き出し装置

301 針穴

9 駆動歯車

12 メス

122 止めねじ

14 糸クランプ

144 バルブ

149 真空発生器

161 ボリューム

903 回転センサ

11 従動歯車

15 結び目検出器

22 CPU

41 糸取りばね

42 糸結び検出器

1 交換糸引き出し装置

31 ナックル

T1 元糸

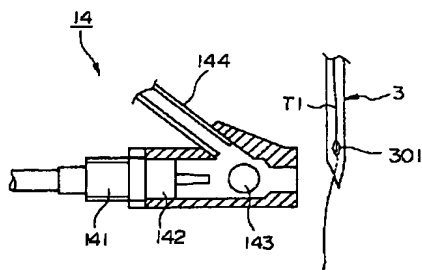
T11 元糸端部（糸巻側）

T12 元糸端部（針側）

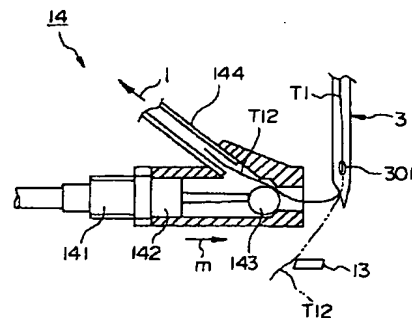
T2 交換糸

T21 交換糸端部

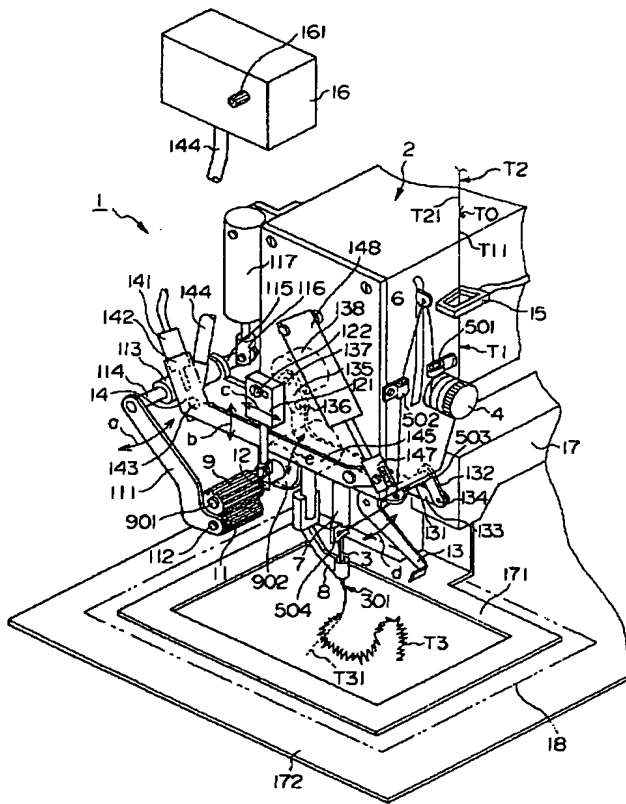
【図8】



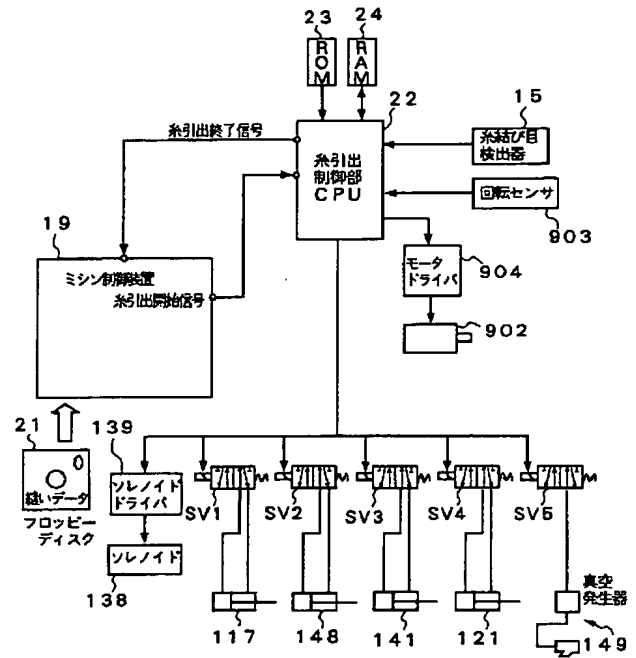
【図10】



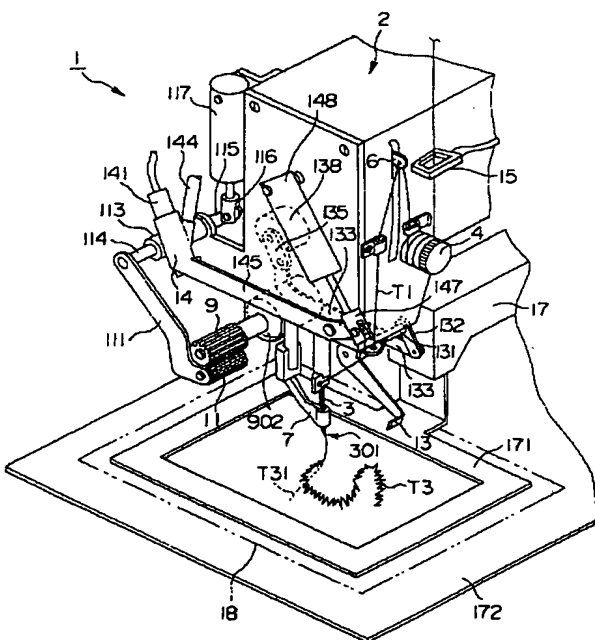
【図1】



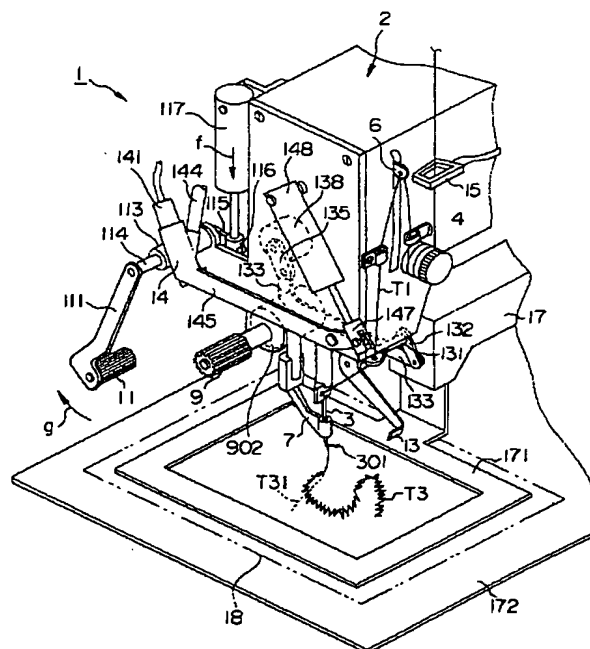
【図2】



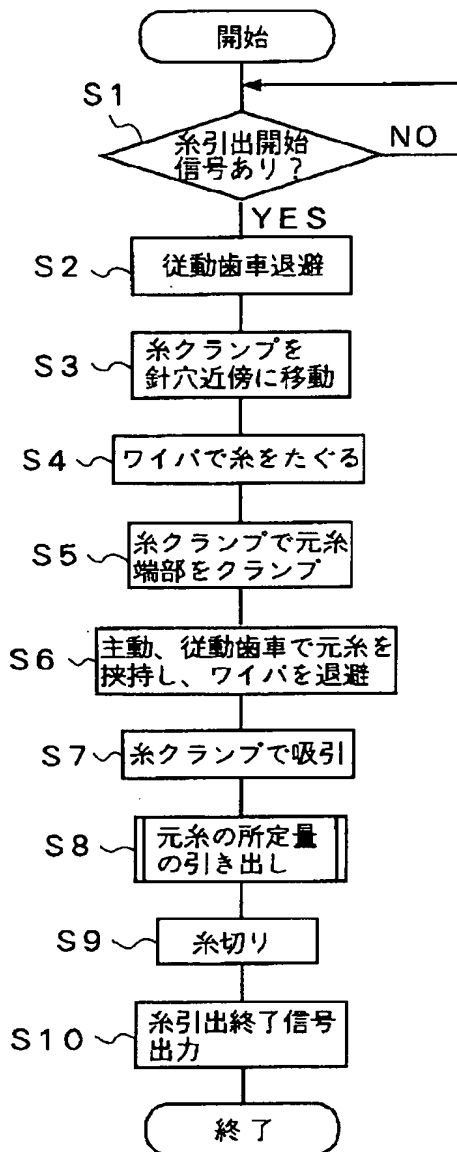
【図5】



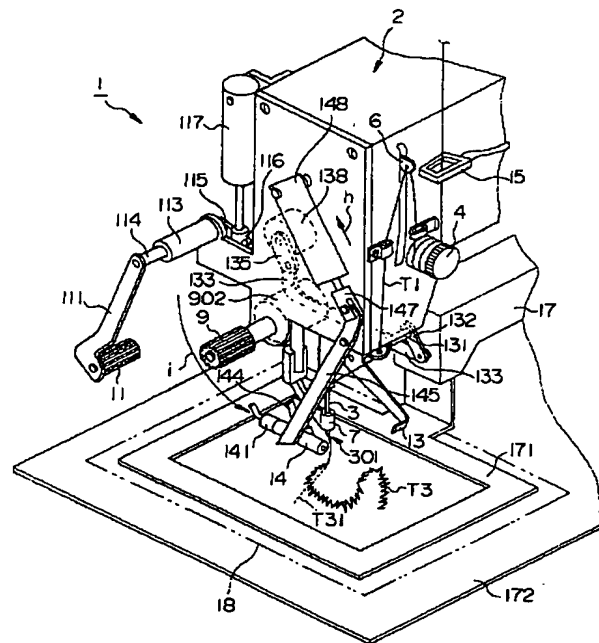
【図6】



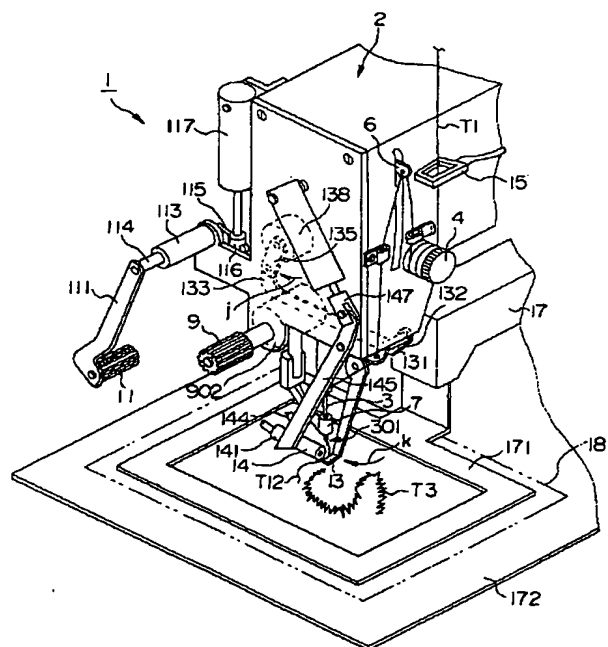
【図3】



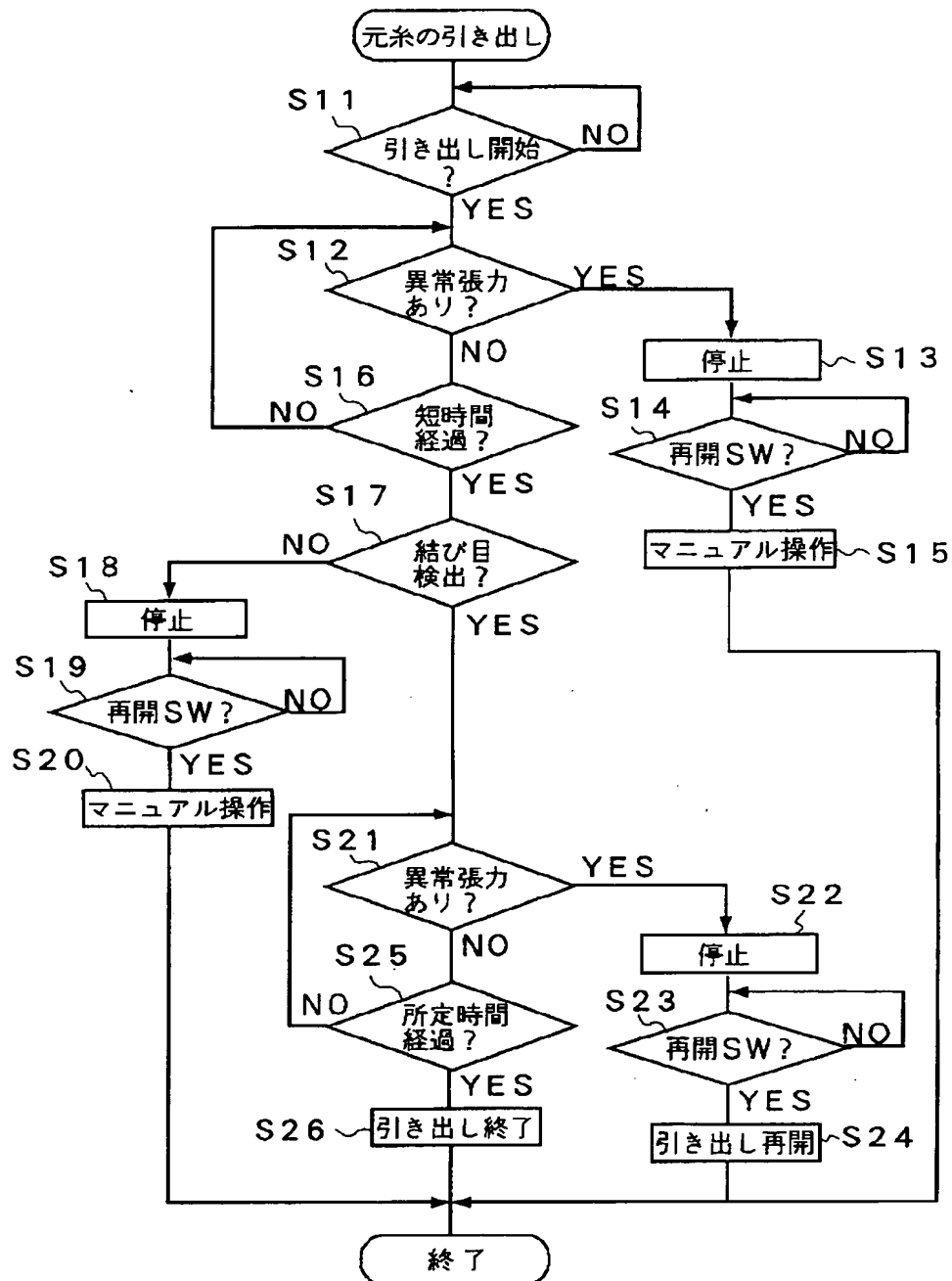
【図7】



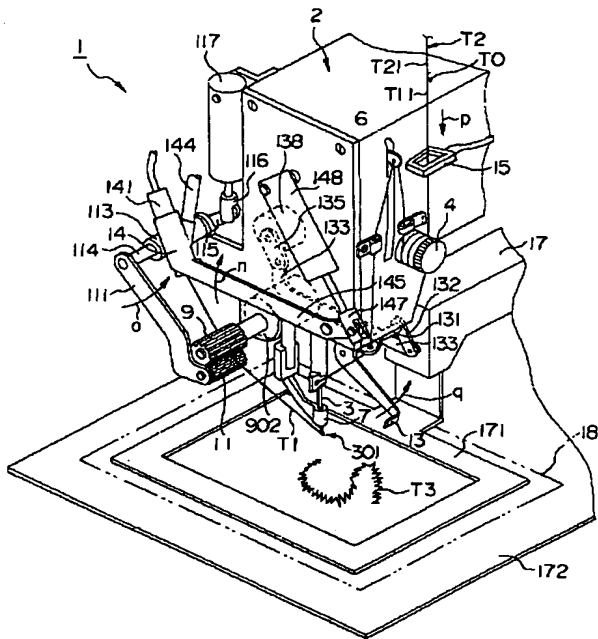
【図9】



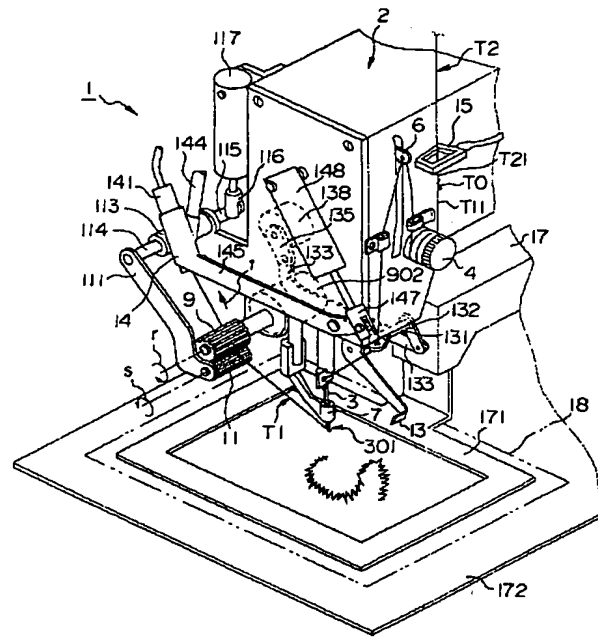
【図4】



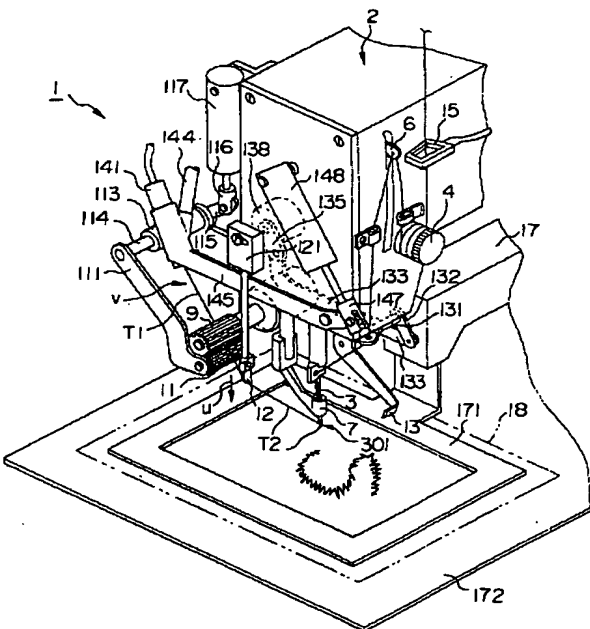
【図11】



【図12】



【図13】



【図14】

